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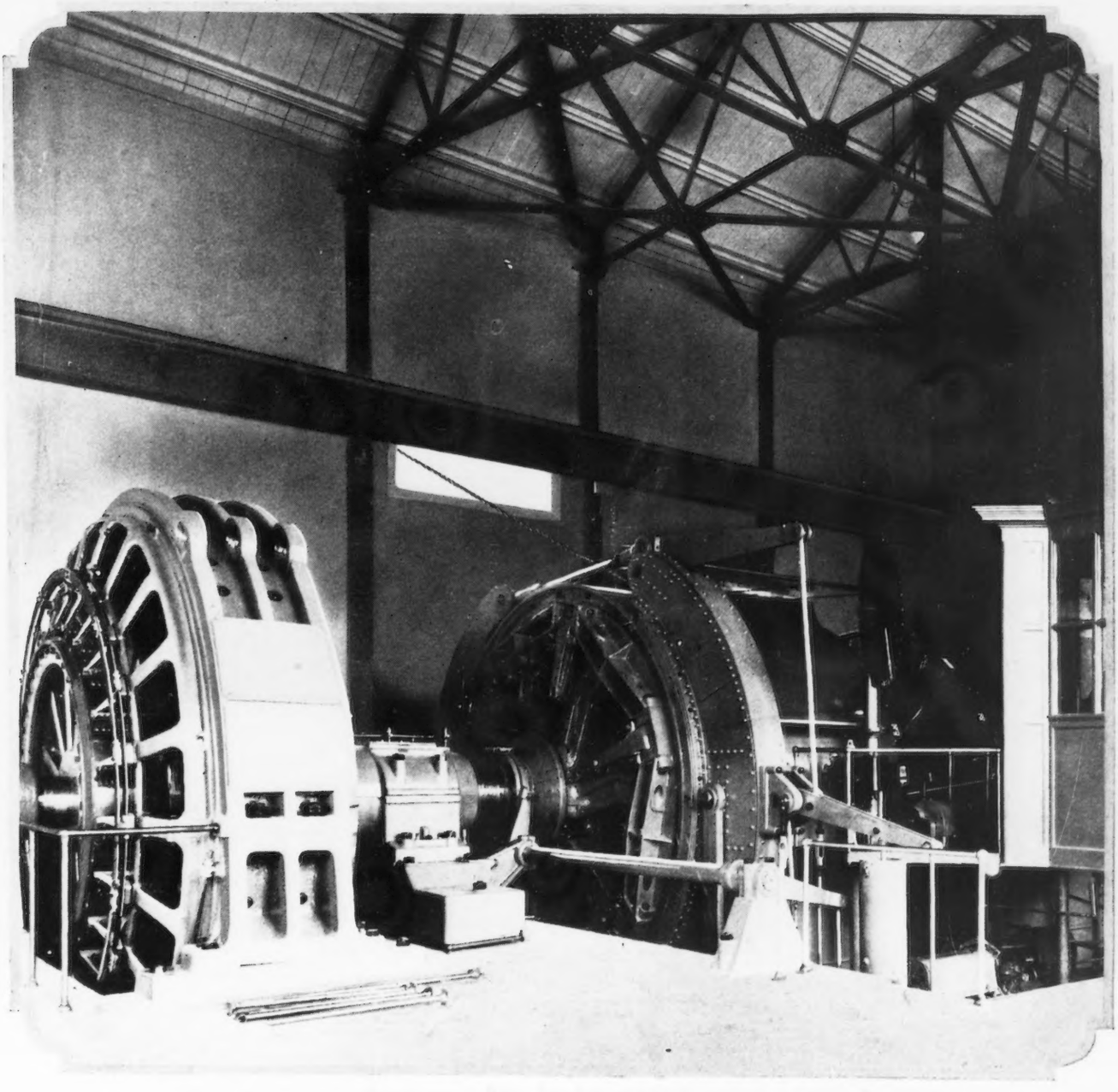

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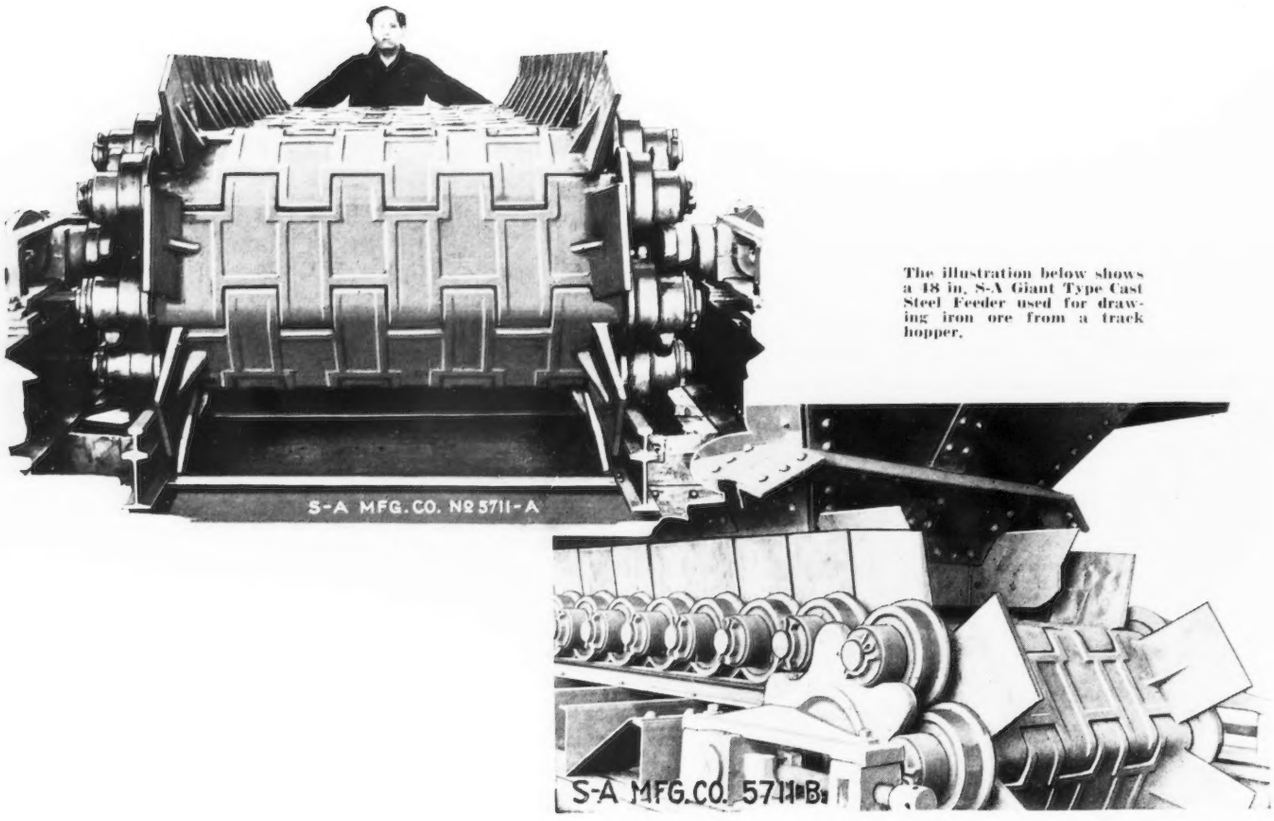
Electrifying the Spruce and Leonidas Mines on the Mesabi Range

A Sketch of Mining in British Columbia, by T. A. Rickard



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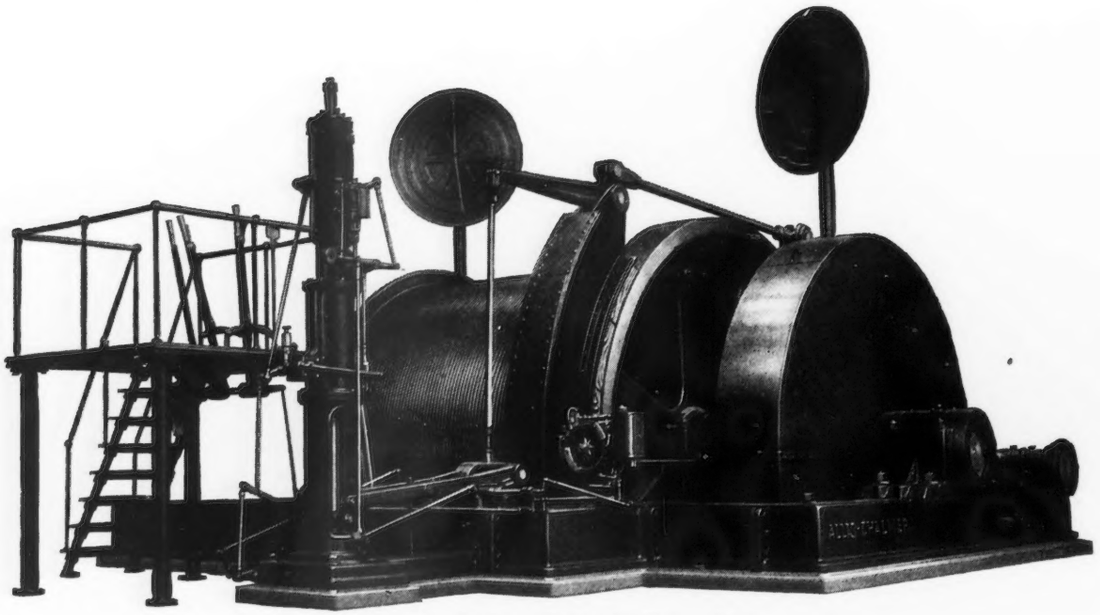

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ENGINEERING AND
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The Colorado School of Mines

ONE HEARS COMPLAINTS, or regrets, that the mining industry is not as active as it used to be, although statistics prove, and daily observation confirms, the fact that the use of metals is enlarging constantly. We are using, and therefore producing, the metals at an increasing rate; we are exhausting our natural resources in such products extravagantly; in short, the mining industry is intensely active. On the other hand, the consolidation of ownerships, the merging of companies, and the operation not of single mines, but of groups of mines, in large units, has the effect of decreasing the number of employers of engineers and metallurgists.

The day of the independent consultant, who flourished in the days of small companies and numerous clients, has gone; the leaders of the profession are employed or retained by the big companies at salaries and fees that seem magnificent when compared with those paid thirty years ago, while the less known or less competent consulting engineer finds it difficult to pay his office rent. There being many of these, the impression is given of a decadence or a depression in mining, such as is not the case.

Mining is the older of the two basic industries of mankind, and our modern civilization is based upon the use of metals. There is no ground for anxiety. Even when the tin, copper, and lead deposits are exhausted, the need for metals for the purposes now performed by the nonferrous and non-precious metals will be met by substitutes, the chief of which will be the iron alloys and possibly the metals of the rock-forming type, such as aluminum and magnesium.

When mining is supposed to be dull, the attendance at the mining schools decreases: a boom stimulates eagerness on the part of our young men to become mining engineers; a slump renders such a professional career unattractive. It is gratifying therefore to note the growth of, at least, one mining school, in a celebrated mining region. The Colorado School of Mines has had its days of adversity, the causes of which are not difficult to discern; today it is in the ascendant, for reasons equally easy to recognize. At the close of the last term, in June, this school had 421 students and graduated 64, of whom 30 obtained the degree of engineer of mines, sixteen that of petroleum engineer, ten that of geological engineer, and eight that of metallurgical engineer. All these had taken a course lasting four years. It is interesting to note that about half of the students come from states other than Colorado and 34 come from foreign countries.

The present writer attended the commencement and can testify to the dignity of the proceedings, which did honor to the president of the school, Mr. Melville F. Coolbaugh, a metallurgical engineer of high reputation. In these days of so-called democratic carelessness, it was pleasant to see such a ceremony performed with a touch of distinction, from the caps and gowns of all who participated—graduating students and members of the faculty—to the excellent addresses of the president of the school and the chairman of the board of trustees. The young men about to commence their careers had the look of intellectual capacity and physical vigor, both of which are needed in our profession. Among them were the sons of engineers and metallurgists, the most conspicuous, by award of prizes, being two sons of Mr. Kuno Doerr, the courteous and competent general manager of the El Paso smelter.

The Colorado School of Mines is the largest institution that is devoted exclusively to the training of engineers intended for the mineral industries; it has much more than largeness, and if the word "intended" is introduced into this context, it is done advisedly, for many men trained as engineers diverge in later years, usually to prove that a thorough engineering training will prepare a man to be a useful citizen in diverse callings.

Ten years ago the Colorado School of Mines was in a bad way; indeed, it has had more than one dip in its upward curve. The trouble was due mainly to a mixture of local politicians and bucolic trustees; these had undermined the good foundation laid by Regis Chauvenet, the president under whom the school first won a good name. Today, besides its efficient president, the school has a board of trustees that works loyally with the faculty and commands the respect of the people of Colorado. Dr. William H. Smiley, formerly head of the public schools of Denver, is the chairman of the board of trustees; he is an experienced educationist and a much respected citizen. With him are Mr. Benjamin F. Hill, a graduate of Columbia and a geological practitioner of assured standing; Mr. Robert H. Sayre, a mining engineer and the son of a mining engineer, a graduate of Harvard; Mr. William A. Way, a lawyer ready to steer his colleagues amid the shoals of legal procedure; and Mr. Max W. Ball, the secretary, a petroleum engineer, an alumnus of the school, a man whose engaging personality and keen mentality have made him well known throughout the West. Evidently this is a good working board of trustees, with enough technical experience and educational enthusiasm to make them real helpers to the president and the faculty.

Besides specializing in petroleum engineering, the school has established recently a department of geophysics, headed by Dr. C. A. Heiland, assisted by Mr. J. A. Malkovsky. Thirty-five students have enrolled in this course, which is devoted largely to electrical ore-finding and kindred matters. It is a sign of the times that this branch of scientific prospecting should be receiving appropriate attention. Special courses are also given in coal mining and fuel engineering, as is proper in a state in which coal mining is an important business.

It remains to add that the school was established officially by territorial legislation in 1874, so that it is junior in age only to the Columbia School of Mines. The first graduates were W. B. Middleton and W. H. Wiley in 1883, the total number of graduates to date being 1,446; but we venture to say that Mr. Wiley, as regards

proof of the character of the training given at the school, is a host in himself; if it produces many engineers of his kind, it will rank second to none.

Clearing Houses for Prospects

UPON THE FRINGES and within known mining districts and elsewhere are many idle "properties" or prospects of all kinds, including once-worked but now abandoned mines, some of the hoary past of fifty years or more ago. There is always talk of reviving this district or that. Every once in a while an old mine is unwatered and given another fling. "Hope is such a bait, it covers any hook."

A clearing house for unexploited or partially exploited properties with information about them and a record of the results of the various examinations that have been made would be valuable and would facilitate the search for mineral properties. Most large mining organizations have in their files numerous reports made by their scouts and engineers, and these are often made available to private engineers. State geological surveys could and some do maintain more or less complete lists of mineral properties, but unless these files are systematically kept up, they are of little more than geographical value. Governmental publications are useful, but are limited in scope to general descriptions and conditions. Also, some of the railroad companies maintain descriptive directories of mining prospects that are in the market. But need exists for collecting systematically the unofficial information about mining properties in each state.

The natural resources production department of the U. S. Chamber of Commerce is now trying to determine to what extent the various local chambers are helping the mining industry and are gathering information about unexploited and partially exploited mineral properties. Pursued to its logical conclusion this is a constructive move to formulate some plan for a "clearing house," as has been suggested at different times. This may well be centered in the established state geological surveys, and it is suggested that chambers of commerce in the mining states co-operate with these government bureaus in developing a "clearing house" where permanent and complete records may be compiled by competent people without ulterior motives. Mining companies might be requested to co-operate also; much can be done toward collating the information now largely in private hands. Such information will have a greater value as the quest for mines becomes more acute.

Why Worry About Petroleum

"DON'T WORRY about tomorrow's oil," says J. Edgar Pew in an article in the *Nation's Business*. Mr. Pew's advice will count heavily with many, for he is prominent in the petroleum world, both as an officer of an important oil company and as a director and past president of the American Petroleum Institute. His optimism as to the outlook for petroleum is well known, for he was chairman of the Institute's Committee of Eleven, which in 1925 issued its report decrying that conservation of oil was needed. The optimism fortunately failed to influence the Federal Conservation Board in reporting its findings to the President. Mr. Pew's assurance at the moment is based on Venezuela's present and prospective bountiful production.

The large majority will follow Mr. Pew's advice. Why should they worry, indeed, about tomorrow's oil when today's production of gasoline is so huge? When the wells stop yielding it will be time enough to think, they would be apt to reason. Besides, is there not abundant coal and cannot oil be made from coal; and, after all, is there not the oil shale? Indeed, the public at large will never worry about petroleum and its products, except as to their market price. The worrying, as in other things, will be done by the few that think.

In fact, the layman probably wonders why there is any need of petroleum conservation, if he gives the matter any thought at all. Every fresh discovery of a pool seems to give the lie to the croakers who have been preaching conservation. Yet he is but treading the primrose path of thoughtlessness. Every pool found is one pool less, and the huger the annual output of petroleum is the nearer is the day when the United States must depend, in part at least, on foreign oil or secure a substitute.

The world's petroleum resource is truly abundant. But a distinction should be made by citizens of the United States between the resources of their own country and those of the world outside. The former have been exploited for many years, while those in other countries with some exceptions are scarcely tapped. In the case of an essential commodity like petroleum a situation such as this should be considered carefully. When Mr. Pew says not to worry about tomorrow's oil he is giving advice that is interesting only to the "world at large." The "world at large," in this sense, is a figment of the imagination. It does not exist, just as it has been reasoned that the "average man" does not exist. Despite the abundance of the world's total petroleum reserve, the oil situation in each separate country will be viewed with complacency or concern according to the situation in that particular country and the intelligence of its citizenry.

Canada's Diamond Jubilee

IN THE WAY of national holidays, Canada seems to keep a step ahead of the United States; its most important one—Dominion Day—the anniversary of confederation, falls on July 1, three days ahead of the corresponding date across the border. Empire Day—Queen Victoria's birthday—falls on May 24, six days ahead of Memorial Day in the United States; and the Canadian Thanksgiving, fittingly combined with Armistice Day, comes in the first part of November instead of at the end of the month. The Dominion Day celebration this year was of more than usual moment, for it was the Diamond Jubilee, celebrating sixty years of successful functioning as a nation. The New York *Sun*, and also probably other United States papers, issued special Canadian editions, and an especially liberal quota of Canadian news appeared in our own pages last week.

Canada is perhaps the most attractive field for mining exploration in the world today. With an area some 20 per cent greater than that of the United States, there is no reason to think that it is not equally well mineralized. Its big disadvantage, the one that retards its development to the greatest extent, is its cold climate. It is not so much the severity of its winters, for one may be as comfortable at 40 below in Canada as at zero or above in

New York City, but rather their length. Two seasons, as the humorist is wont to say—July and winter. In the short warm season prospecting is made disagreeable in many sections by vast swarms of black flies and mosquitoes. The cold weather does not interfere seriously with mining—in fact, it may be an aid, as witness the fact that the McIntyre mine anticipates no trouble from heat at depth, the rock temperature at 4,100 ft. being only 62 deg. F.; it does, however, interfere with the comfort of the inhabitants, and is no doubt largely responsible for the disappointing progress made in the population figures, the total still being a little below 10,000,000.

One does not need to be an optimist to predict a brilliant future for Our Lady of the Snows, in mining and in other forms of industry as well. Already it is the world's largest producer of nickel and asbestos, and a decidedly important producer of gold and many other metals and minerals. Its opportunities are being impressed upon automobile tourists to the number of about 5,000,000 a year—half its native population. They find there a stable government and a friendly country, peopled with intelligent men and women speaking the English language; certainly much more desirable conditions for investment than are present in more remote lands also awaiting development—Russia, for example.

A diamond wedding anniversary—and no doubt a Diamond Jubilee also—may be celebrated either after sixty or seventy-five years. Fifteen years from now perhaps Canada will have another, and it may be predicted that at that time new Porcupines, Kirklands, Cobalts, Sudburys, Premiers, and Sullivans will be famous camps.

The Antipodal British Commonwealth

AUSTRALIA is only a little smaller than Canada, and about the same size as the United States, with only a little over half of Canada's population. It is a younger British Commonwealth, having celebrated its silver anniversary only last year. There, agriculture and pastoral pursuits are of commanding interest, though mining activities have attracted much attention. It suffers from its remoteness from the industrial communities of the world, a condition as difficult to overcome as is Canada's climate. But some of its man-made conditions are unfortunate, too, as may be gathered from a glance at the news articles featured in this issue, wherein Mr. Murray, for example, suggests that the country is suffering from national mismanagement—perhaps too much aping of practices that have proved successful in the United States but that are not adapted to Australia, and too much labor-union government. These things can be righted and probably will be as national experience is gained; as others like Mr. Murray visit the rest of the world and study international conditions and relationships.

Safety at Kennecott

KENNECOTT made a safety record in the month of April. Not an accident was reported. This is the direct result of a campaign of education and rule enforcement conducted among the employees. It demonstrates what can be done by concerted effort. It presupposes also a long period of careful training. Workmen are not made careful overnight. Perhaps a company isolated as Kennecott is, and in consequence having a smaller number of "floating" employees who work today and are gone tomorrow, enjoys a slight advantage when it seeks to train and educate its men. Floaters are usually careless. They know little of the company's ways and are lacking in *esprit de corps*. None the less, at Kennecott wise and careful management is evidenced by this achievement.

Scientific Taxation Needed

IN A LATE ISSUE of *The Dearborn Independent*, Charles Johnson Post makes a plea for scientific taxation. He makes this significant statement: "Our tax laws are nothing but an evolution of the ignorance of the historic past. They are not based upon scientific principles. Originally taxes were nothing but tribute, or plunder, exacted from a conquered people; and their collection was farmed out to tax gatherers who extorted as they chose so long as they turned in to the central government a fair share of the plunder."

Mr. Post states that we fine the man who builds better and safer houses and we fine the man who increases the manufacturing business of the nation and increases the amount of wages that he pays, and who adds to the wealth and purchasing power of the country. "We fine them by higher taxes." On the other hand, Mr. Post says that the man who owns land and lets it run to weeds and scrub or tin cans and rubbish pays the lowest taxes.

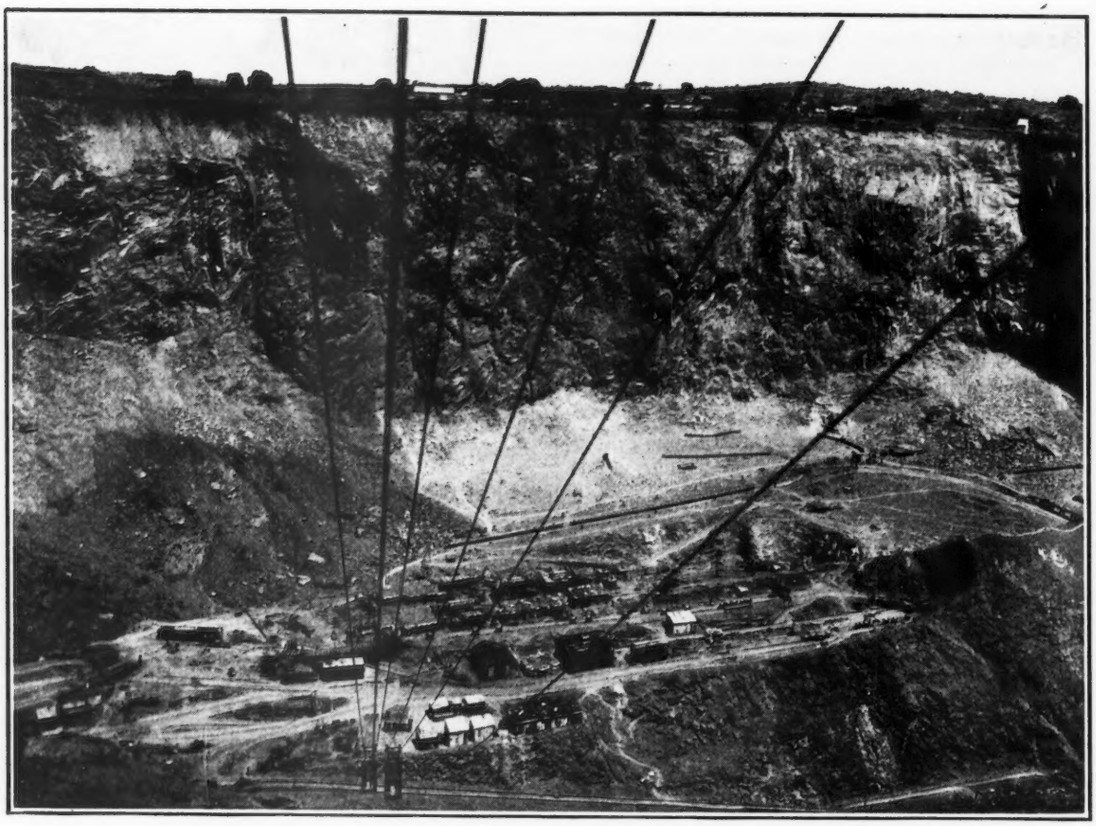
Enterprise and thrift carry the tax load. An increasing scale of taxation restricts buying. Higher taxes mean higher rents, and this in turn engenders higher prices and therefore more restricted buying. In the case of a mine, higher taxes increase costs, automatically reduce ore reserves, and lead to selective mining with fewer workers and smaller outgo for materials and supplies. Higher taxes reduce employment directly and indirectly. This in turn lessens the prosperity of the community.

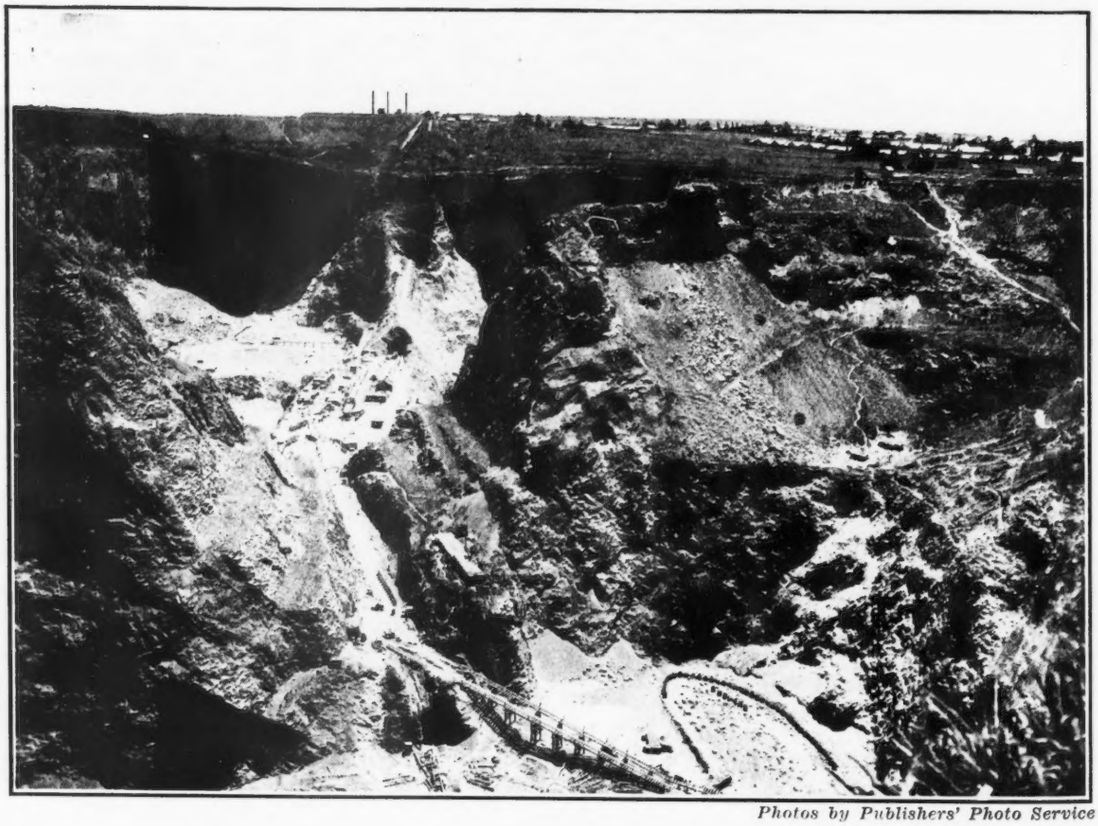
Perhaps something can be attained by a revision of methods of taxation, but the immediate remedy lies first in abolishing tax exemption of all kinds and second in basing taxation upon net earnings in the case of industries. Of greater importance, however, is the need for economy in public expenditures and a progressive reduction in taxes. The reduction is now particularly appropriate, with a surplus of $600,000,000 in the federal treasury, as President Coolidge declared in his budget speech of June 10.

Momentarily we are prosperous, but it is not generally realized that a part of this prosperity has been obtained by discounting the future. State, local, and municipal governments have increased their bonded indebtedness greatly and apparently without a thought of what is to come. The moneys thus obtained are spent in a relatively short period of time and are therefore a contributing element in this momentary prosperity. Payment of interest and principal is extended over a long period of time, and after the principal has been spent communities suffer a diminution in purchasing power that is too often not offset by benefits derived. Concentration of purchasing power through the rapid expenditure of the proceeds arising from the sale of public bonds benefits a few at the expense of all.

The federal government has pointed the way by its progressive curtailment of expenditures, but there is great need for state, county and municipal governments to emulate its example and to make a consistent reduction in local taxes.

Pit of the Premier Diamond Mine, Near Pretoria, in the Transvaal





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Over 5½ Million Carats of Diamonds Mined in 1926

A Review of the Industry

By Sydney H. Ball
Mining Geologist, 26 Beaver St., New York

A diamond mine in the Belgian Congo

THE DIAMOND-MINING COMPANIES enjoyed a prosperous year in 1926, although it was beclouded a bit in its last quarter by a surprisingly large production from new alluvial fields in South Africa. In that quarter and early in 1927 there may have been a slight overproduction. The industry, however, has occasionally passed through much more serious periods of overproduction with flying colors. It faces the future with optimism warranted by the sane sales policy of the Diamond Syndicate, by its single sales channel, by the strong technical position of the industry, and by the ever-increasing demand for diamonds. During 1926 the influence of the increase in alluvial production was more than offset by the fact that development work has made it apparent that the East African Mwanza pipe is of little importance and is not to be a factor in diamond production for decades. Technically, the producers' position is therefore stronger than it was a year ago.

Production in 1926 was approximately as shown in Table I.

Table I—World Production of Diamonds in 1926

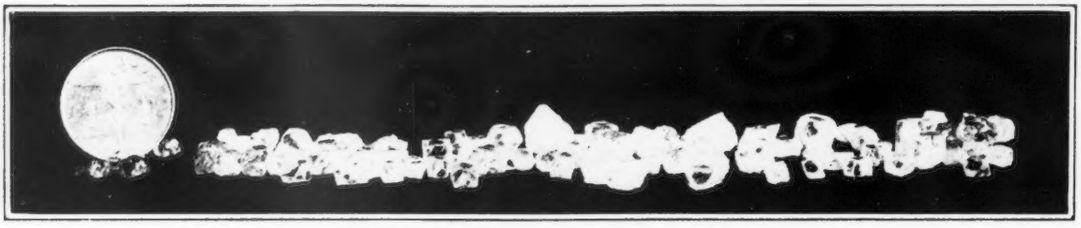
	Pipe Mines, Carats	Alluvial Production, Carats
South Africa	2,393,783.75	808,329
Belgian Congo-Angola		1,258,000
Southwest Africa Protectorate		520,000
Gold Coast		417,000
British Guiana		190,000
Brazil		50,000
Tanganyika Territory		7,000
Borneo and miscellaneous		5,000
Total		3,255,329
Grand total, approximately		5,649,100

The total of 5,649,100 carats represents an increase of 28 per cent over the 1925 output, an increase that was largely accounted for by producers of small stones of mediocre quality. The increase in rough stones suitable for cutting was not nearly as much as 28 per cent. Of this total the pipe mines of South Africa produced a little over 42 per cent and the Union of South Africa 56 per cent. Striking features in 1926, besides the markedly larger South African alluvial output, were the increased production of the Gold Coast (250 per cent of 1925) and the normal growth of the Belgian Congo-Angola fields. To obtain this 0.43 cu.yd. of diamonds, only a part of which is of gem grade, approximately 9,000,000 cu.yd. of material was treated.

Effect of Diamond Syndicate Beneficial

The new Diamond Syndicate had a beneficial effect on the trade in 1926. Sales increased and prices advanced slightly. The Syndicate controls or works with producers accounting for about 90 per cent of the world's production. During the year it arranged to handle all or the greater part of the production of British Guiana, and is said to be purchasing 70 per cent (and at that the better grades) of the new Transvaal alluvial production. The mines in 1926 sold about $74,000,000 worth of diamonds. The figure is presumably slightly greater than the world's consumption at present, so that the Syndicate's purchases in 1926 may well have exceeded its sales by some $5,000,000. This excess should be absorbed in 1927, provided the world demand increases normally.

The United States is the principal consumer of diamonds, and 1926 was a banner year, imports being about 9 per cent greater than in 1925. Most of the increase was in rough stones, which came principally from Great Britain. The Netherlands was the largest ex-



One hundred carats of rough diamonds

porter of cut stones, and was followed by Belgium. Since 1912 the imports of rough goods into the United States have been more or less stabilized; in other words, the cutting industry is not markedly expanding. The value of cut stones during the period has, however, doubled. Total imports have increased irregularly, but have averaged about 7 per cent a year. This increased demand in America alone is equivalent to a 5 per cent increase in the world's consumption.

Table II—Diamonds Imported Into the United States in 1925 and 1926

	1925		1926	
	Carats	Value	Carats	Value
Rough, uncut	171,842	$9,492,326	236,953	$13,070,767
Cut but not set	513,783	49,620,666	555,363	51,361,942
Imported from				
Belgium	239,290	21,336,808	254,973	20,875,576
France	8,314	1,497,219	10,639	1,413,542
Netherlands	252,202	25,264,131	266,789	27,079,149
United Kingdom	10,865	1,173,456	21,372	1,778,386
Other countries	3,112	349,052	1,590	215,289
Total imports		$59,112,902		$64,432,709

Canada is increasing her imports and is a potential market of importance. In 1926, England, owing to its prolonged strikes, purchased few stones. France similarly, because of the high taxation, purchased less than its normal quota, although some investment buying took place. The Central European countries again entered the market on a small scale, as did Russia, although of course diamonds had to be smuggled into that country. As before the war, Russia wants quantity, not quality—that is to say, showy stones. India and Central America were also purchasers of the poorer grades.

Rough Stones Scarce at Times

The market for rough diamonds was strong, and at times there was an actual shortage of goods. Prices were higher on the average than in 1925, perhaps by 10 or 15 per cent. In October independent brokers began to offer a few stones from the new Transvaal alluvial fields, and in November the Syndicate cut the price of medium-grade stones somewhat. In short, in the last quarter of the year the increased Transvaal alluvial production was a disturbing element in the trade.

For cut stones the market was good, particularly in June, July, August, and September. In December the American Christmas trade was adversely affected by exaggerated statements in the press as to the menace of the increased Transvaal alluvial production. In 1926 there was an upward tendency in the price of cut goods and cutters still complain of mounting labor costs.

The cutting industry in the United States had a prosperous year, as is indicated by the increased imports of rough. There was little unemployment among the 15,000 workmen in the Belgian shops, who yearly receive wages of $8,850,000. The 9,000 Amsterdam workers were less continuously employed, and in Paris increased taxes have decimated the cutters' ranks.

The Union of South Africa (see table on page 48) increased its production in 1926 by 32.4 per cent, the production of the pipe mines being 109 per cent and that of the alluvial mines 340 per cent of that of 1925. Average value of pipe stones per carat was 55s. 10d., a slight increase over that of 1925. The value of alluvial stones fell from 159s. 5d. to 98s. 7d., a measure of the relatively poor quality of the alluvial stones from the new fields. Sales totaled £10,961,814, a figure exceeded in only two previous years in the industry's history.

Of the South African pipe mines, three are of major importance—DeBeers, Premier, and New Jagersfontein. DeBeers Consolidated Mines, Ltd., the world's most important diamond-producing company, in the year ended June 30, 1926, washed a total of 4,527,373 loads; 3,874,011 of these came from the mines and the rest from stock on the floors. Its diamond sales totaled £4,193,866. Dividends absorbed £2,435,771, and £409,558 was paid to the South African Government in taxes. The net profits for the last three years have been respectively £1,441,635, £2,193,430, and £3,160,632. Sir Ernest Oppenheimer, chairman of the Anglo-American Corporation, joined the board during the year, and his company is now one of the largest stockholders.

The Premier Diamond Mining Co. in the year ended Oct. 31, 1926, sold diamonds to the value of £1,456,714 7s. 3d. This was £185,651 more than in the preceding year. Indeed, all diamonds produced during the year were sold. The company's product is directly competitive with that of the poorer alluvial stones, and, in consequence, the value per carat fell from 34s. 8d. in 1924-25 to 30s. 5d. in 1925-26. The profit realized was £765,108 17s. A total of 959,124 carats was recovered by washing 4,892,696 loads. Operating costs were 12s. 4.18d. per carat. The average depth of the mine is 339 ft., an increase of 14 ft. during the year. In all 477 Europeans and 5,275 blacks were employed in 1926. On the whole, Premier has not benefited as much as most companies by the good diamond market of the last two years.

New Jagersfontein Mining & Exploration Co. in the year ended March 31, 1926, washed 1,603,908 loads and recovered 126,780 carats. Because of delays in receiving necessary new machinery, the company, which produces fine stones, was not able to produce the quota accorded it by the Diamond Syndicate. Since the annual report was issued, the new machinery has been installed and larger profits are to be expected.

The Koffyfontein Mines, Ltd., in the year ended June 30, 1926, produced 80,988 carats from 924,876 loads of blue ground. DeBeers controls the company. Among the other companies operating pipes in South Africa are the West End Diamonds (production year ended June 30 last 37,090 carats); the Crown Diamond Mining & Exploration Co. (1926 production presumably about 24,000 carats), and the New Monteleo Diamond

Mine (production year ended Sept. 30, 1926, 2,591 carats).

As is always true when the industry is prosperous, a large number of new diamond enterprises were floated in 1926. At least nineteen flotations have come to my attention, some of them re-financing old failures, others attempting to find new pipe mines, and others formed to work alluvial deposits known to be more or less diamondiferous. Naturally, the mortality among such projects is high.

Alluvial Mining of Exaggerated Importance

The rush to a new South African alluvial diamond field is a spectacular show, and from time to time a poor man makes a rich stake; in consequence the opening of a new alluvial field has news value, which in the last year has given an exaggerated idea of the importance of this factor in diamond mining. All of the increased alluvial production in 1926 was caused by the bringing in of large and rich areas in the Lichtenburg field. The Diamond Syndicate, however, bought the major portion of the production, and the industry has well absorbed the increased output. Unlike most "river" stones, the Lichtenburg diamonds are of relatively poor quality. The 6,105 whites and 22,304 blacks employed in digging in January, 1926, had grown by September to 14,031 and 51,600 respectively. A recent government return shows that in the new diamond fields 43 per cent of the diggers are ex-farmers, 11 per cent are unemployed, and only 9 per cent are bona-fide diggers. Certain of the diggers have done exceedingly well, but, as in October, 1926, the banner month, the production was only $1.31 per man-day, many are not making wages. The great majority will soon be clamoring to get their old jobs back, many of which, of course, have been filled by less adventurous souls. Although alluvial digging as now conducted is detrimental to the Union of South Africa, it certainly during the last year has put in circulation a considerable amount of money among the Transvaal farmers, who have had a number of disastrous crop years.

As in past years the government has thrown open many new public diggings. On April 9, 1926, the Swartsplaats (near Ventersdorp, western Transvaal) rush took place. Two thousand runners started at the drop of the mining commissioner's flag to peg claims. On July 21 another rush occurred to peg claims at Rhoodepan, in the same region. On June 10 the greatest South African rush, with the exception of the 1927 Grasfontein rush, occurred at Elandsputte, in the Lichtenburg district, western Transvaal. Twenty thousand people were present, and 10,000 runners at the signal sprinted madly to stake claims. On Aug. 16 a smaller rush took place at Vaalboschputte, in the same region. On Aug. 19 adjoining farms, among them Treasure Trove, were thrown open, and 15,000 peggers participated in the rush. On Nov. 11 Wondergat was thrown open, 5,000 diggers seeking claims. Some of these farms are already exhausted, and though the total diamond content of this part of the Transvaal is undoubtedly large, the life of the deposits will be relatively short so far as large production is concerned.

The African & European Investment Co. has about ten farms in the Lichtenburg district, some of which are diamondiferous, and when these are worked the company's position should be materially bettered. An interesting type of company is that which owns diamond-bearing farms and which rents store sites, furnishes water to the diggers, and receives the owner's share of claim licenses. Several of these companies, which sprang up in 1926, notably the Treasure Trove Syndicate and the Carrig Diamond Syndicate, have been quite successful.

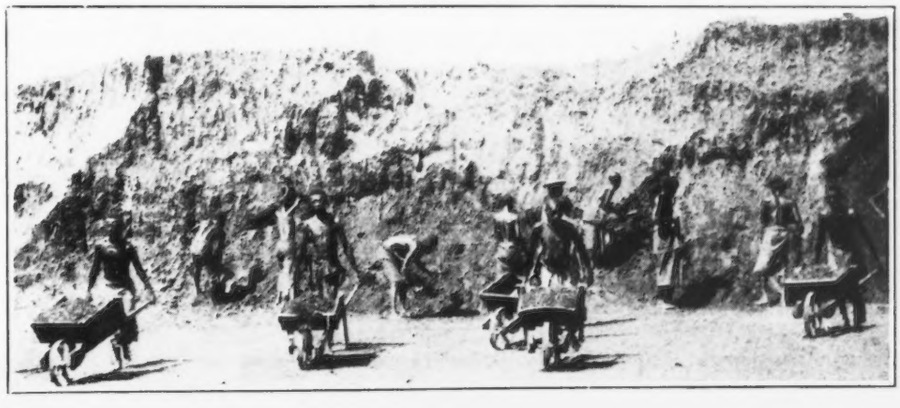
Diamonds on Atlantic Coast of Cape Colony

In 1925 a few diamonds were found at Port Nolloth, on the Atlantic coast of Cape Colony, south of the mouth of Orange River. Various places along the coast contain diamonds, and a few stones have been recovered by primitive methods at one locality. The stones found in the earlier prospecting are reported to resemble those of Southwest Africa, but later discoveries are of better grade. The country is desolate and inaccessible, and in consequence development is tremendously difficult, but some production from this region is to be expected in 1927. Part of the region was thrown open to pegging in December. The older Cape Colony alluvial deposits had a normal year, and their product, as always, was of high grade.

The Belgian Congo-Angola field, in Central Africa, is second to South Africa as a diamond producer, both as to carats produced and value of product. It produced a little over 22 per cent of the world's caratage in 1926. Figures in Table III are from the Société Générale's annual report, that bank being a large stockholder in all of the companies:

Table III—Diamond Production of Belgian Congo-Angola Field in 1926

	1925, Carats	1926, Carats
Belgain Congo Companies		
Forminiere	228,000	245,000
Beceka	579,500	770,000
Kasai	54,720	63,000
Luebo	23,980	30,000
Angola Company		
Diamang	126,571	150,000
	1,012,791	1,258,000



Removing overburden from diamond-bearing gravel

The Administrator of Southwest Africa in his 1926 report gives the figures in Table IV as to diamond mining in that British protectorate. The administrator

Table IV—Diamond Production in Southwest Africa in 1926

Year	Carats Won	Number of Diamonds per Carat	Diamonds Sold, Carats	Price per Carat, Shillings	Total Value
1920	606,424	5.173	230,751	138.66	£1,599,849
1921	171,321	6.8	121,557	81.034	492,513
1922	144,156	7.56	297,600	53.17	791,211
1923	433,229	6.5	495,675	66.8	1,656,700
1924	492,696	7.1	449,846	54.43	1,224,441
1925	514,956	7.3	693,174	54.6	1,888,867

predicted that the 1926 production would be about that of 1925. The protectorate government is as financially dependent on the industry as Chile once was upon the nitrate industry. The Consolidated Diamond Mines of Southwest Africa, controlled by the Anglo-American Corporation, accounts for well over 90 per cent of the protectorate's production. Its initial dividend of 12½ per cent was paid in December, 1925, and its second dividend, of the same amount, on Feb. 10, 1927.

Diamonds were found in 1919 in the Gold Coast, West Africa, and since then it has become a rather important producer. In 1924 exports were 53,717 carats, in 1925, 77,313 carats, and in 1926, 299,835 carats. The principal company is the African Selection Trust, the West African Diamonds Syndicate's production being small. Other companies are prospecting. Usually, the stones are small, averaging perhaps 20 to the carat. The largest stone yet found weighed 9 carats.

The African Selection Trust in 1926 had two plants in operation. Two others came into operation in the fourth quarter of the year, and a fifth is soon to be shipped. The 1926 production approximated 400,000 carats. Reserves late in December, 1926, were given as 7,000,000 carats, with some ground still unprospected. The West African Diamond Syndicate is reported to have reserves of about 1,000,000 carats in gravel averaging about one carat per cubic yard. The 1926 production was about 18,175 carats.

British Guiana produced in 1925 1,160,271 diamonds, weighing 188,895 carats, valued for export purposes at £819,816. In 1925 the stones went 6.17 per carat and were valued at $21.56 per carat. Negro miners employed are estimated to number from 10,000 to 15,000. The largest stone found weighed 24½ carats. The 1926 production was presumably about 190,000 carats. A road part way into the diamond fields is being opened up. The United Diamondfields of British Guiana, Ltd. (capital £500,000), was floated in London in October, 1926. It has acquired 20,000 acres of claims which in the past have produced diamonds. By modern mining methods the company states that it expects to make large profits, and has erected two washing plants in the field. The Diamond Syndicate is to purchase the product.

At the beginning of 1926 a grave danger overhung the diamond industry, as at that time it appeared that the Mwanza pipe, in Tanganyika Territory, might be of great commercial importance. The Anglo-American Corporation in December, 1925, agreed with the owners, the Tanganyika Diamonds, Ltd., to develop the property for an interest, and later assigned the contract to its subsidiary, the Mwanza Development Syndicate. In mid-September, 1926, F. A. Unger, assistant consulting engineer of the Anglo-American Corporation, estimated that the eluvial deposit totaled 410,000 loads, containing 53,000 carats of diamonds. In 1925 440 carats were produced and in 1926 about 7,000 carats. The content of the kimberlite itself is reported to be non-commercial. In 1925 the Kundelungu-Lualaba Exploitation Committee, a subsidiary of Tanganyika Concessions and Zambesia Exploring Co., prospected the kimberlite pipes in the Katanga, Belgian Congo. Diamonds were found in the majority of these pipes, although no commercial deposit was found.

Brazil now produces about 20,000 carats of carbonadoes, and prices are markedly higher, as there is an actual shortage, the use of the diamond drill in oil exploration increasing the demand for black diamonds. Of most of the other industrial types there is a surplus supply. In March, 1926, L. M. Van Moppes & Sons, an important London dealer in industrial stones, made a contract to handle the industrial stones of the Diamond Syndicate. In February the market discounted this by increases in price in several grades, especially in crushing bort, in which the rise was from 12½ to 14½s. and by the year end to 16s. 6d. The market was strong for the first six months, and then for the rest of the year the demand became slack, although prices were firm. Imports of industrial stones into the United States diminished from 1925 to 1926, as is shown in the following table:

Table V—United States Imports in 1926

	1925		1926	
	Carats	Value	Carats	Value
Diamond dust and bort	.....	$760,476	.....	$271,417
Glaziers, engravers, and miners, diamonds	46,556	1,976,640	41,475	1,939,735

McIntyre Porcupine Milling Costs

During the nine-month period ended March 31, 1927, the McIntyre Porcupine Mines, Ltd., operating in northern Ontario, milled 385,409 tons of ore averaging $8.08 per ton for a net recovery of $7.67. The following table gives the details of milling costs:

	Labor	Supplies	Repairs and Maintenance	Power	Total	Cost per Ton
Ball milling	$7,099	$19,257	$627	$9,226	$36,211	$0.0940
Tube milling	5,403	49,175	1,728	22,332	78,640	0.2040
Classification	4,954	3,268	426	2,908	11,557	0.0300
Pumping and elevating	5,704	4,688	118	3,235	13,746	0.0357
Agitation	5,704	855	102	4,496	11,159	0.0290
Thickening	5,704	2,281	782	1,690	10,459	0.0270
Clarification	7,817	2,912	183	1,308	12,221	0.0317
Precipitation	5,704	11,928	163	1,613	19,409	0.0504
Reagents	.....	48,652	.....	.....	48,652	0.1262
Filtration	8,134	3,477	499	2,717	14,829	0.0385
Refining and assaying	10,184	6,528	205	382	17,299	0.0449
Heating	.....	5,551	98	.....	5,649	0.0147
Tailing disposal	.....	2,462	2,058	1,915	6,436	0.0167
Mill alterations	1,192	1,272	.....	.....	2,464	0.0064
	$67,604	$162,312	$6,993	$51,827	$288,738	$0.7492

Calumet & Hecla Cuts Copper Production Cost

Evidence of the economies made in the last few years in the cost of producing copper is afforded by a study of the last three reports of the Calumet & Hecla Consolidated Copper Co. In 1924 the cost per pound of copper, without including depreciation and depletion, was 12½c.; in 1925, 11¼c.; and in 1926, 10½c. Production increased in each year, being 54,510,000 lb. in 1924, 64,250,000 in 1925, and 73,297,000 in 1926, the increased rate of production, of course, aiding in the reduction of the cost per pound. Costs of producing copper at the tailing reclamation plants of the company, which are considered separately, have varied between 7 and 8c. on tailing with a copper content between 0.6 and 0.7 per cent.

Metallurgical Methods at Chuquicamata

Primary Crushing Plant Handles 2,500 Tons per Hour —Tank House Has 1,098 Cells

AT THE plant of the Chile Copper Co., at Chuquicamata, according to the magazine *Chile*, the ore after being crushed is leached with a dilute sulphuric acid solution and resulting solutions from leaching are electrolyzed, obtaining commercial cathode copper running about 99.5 per cent pure. These cathodes are in turn melted and refined, and cast into market shapes, such as wire bars, cakes, and other forms, and are 99.96 per cent pure. These shapes are then ready for the world market. This is one of the few mining properties in the world where the ore is mined, milled and refined, and shipped in marketable form, all from one plant.

There are two primary crushing plants: one consisting of a single car dumper with two 84-in. jaw crushers, which has been in service since 1917, and the second—nearing completion—consisting of a double rotary car tipple, capable of dumping simultaneously two 70-ton ore cars into two 60-in. gyratory crushers. Each of these crushers weighs 960,000 lb., is 25 ft. high by 20 ft. in diameter and is driven by a 500-hp. motor. This primary can handle 2,500 tons of ore per hour.

From the primary crushing plant the ore is delivered into ore bins, having a capacity of 22,000 tons. From the bins the ore is drawn to pass successive stages of crushing, first in No. 10 gyratory crushers—of which there are seven—and then through Symons disk crushers, of which there are a total of fifty, until the final product is down to about ⅜ in. in size.

The ore is handled between the different crushing units to the leaching vats by means of a system of 31 belt conveyors, of which 18,485 ft. are in operation throughout the plant. One of the belts is 2,200 ft. long and 48 in. wide, and handles the final product of crushed ore at the maximum of 2,500 tons per hour.

The final crushed ore is charged into leaching vats, of which there are thirteen. These vats are built of reinforced concrete, lined with reinforced mastic to protect the concrete against the copper sulphate solutions. The vats are 150 ft. long by 110 ft. wide by 18 ft. 6 in. deep, and hold on an average of 10,000 metric tons.

The process of leaching the ore consumes about six days, and after it has had its final wash it is excavated by means of unloading bridges, which are in the form of gantry cranes spanning the vats, and the leached ore, or "ripio," as it is known locally, is dug with clamshell buckets having a capacity of twelve tons each. There are four of these discharging bridges installed, any three of which are capable together of taking out 35,000 tons in nine hours. The ripio is drawn from the hoppers of the discharging bridges into 12-yd. side-dumping standard-gage cars, which are hauled around the ripio loop by 70-ton locomotives, and the cars are dumped by hand. The top of the ripio dump, which is level, constitutes at present an area of 165 acres. The face of the dump is about 4,920 ft. long, and has an average vertical height of 170 ft.

The first solution off in the leaching process, known as "strong solution," is what must be electrolyzed in the electrolytic tank house, but before it can be so treated it is necessary to extract as much as possible of the chlorine which it contains. The normal chlorine content of strong solution averages about 1.0 gram per liter and to reduce this amount it is necessary to agitate cement copper in the solution, thus forming cuprous chloride, which is afterward precipitated out of the solution. The cement copper for this purpose is obtained by precipitation from scrap iron. The plant consumes slightly over 1,000 tons of scrap iron per month in this part of the process.

One of the very important features of the leaching department, which has been developed in Chuquicamata, is the use of wood stave pipe lines for handling the copper-bearing solutions. These solutions carry an average of 5 per cent sulphuric acid, which obviously cannot be carried in iron pipes, and, owing to the presence of nitrates in the solutions, lead pipe is also unsuitable. The wood stave pipes for this purpose are all manufactured locally, and run in sizes from 6 in. to 24 in. in diameter. At present 66,816 ft. of this pipe is in service. There is a total of 69,000 tons of copper-bearing acid solution in the system at all times, of which the copper content averages 1,500 tons and the acid content 3,000 tons. The handling of this solution is accomplished mainly with sixteen 15-in. vertical type acid pumps, each driven by a 200-hp. motor. They circulate solutions at the rate of 143,000 tons per day.

The electrolytic tank house is a three-bay structure, 1,388 ft. long by 160 ft. wide, equipped with twelve electric traveling cranes. There are ten distinct electrical circuits for the deposition of copper, each one of which can carry a load of 16,800 amp. at 250 volts. There are 1,098 electrolytic cells, each constructed of reinforced concrete, 19 ft. 2 in. long by 3 ft. 11 in. wide by 4 ft. 10 in. deep. The equipment in such a tank house naturally consists of a great deal of copper in the form of leads, terminal bars, suspension bars and in the insoluble anodes; in this particular case there are 4,462 tons of copper in this one installation. The tank house, fully equipped, contains 55,990 insoluble copper silicon anodes manufactured in Chuquicamata.

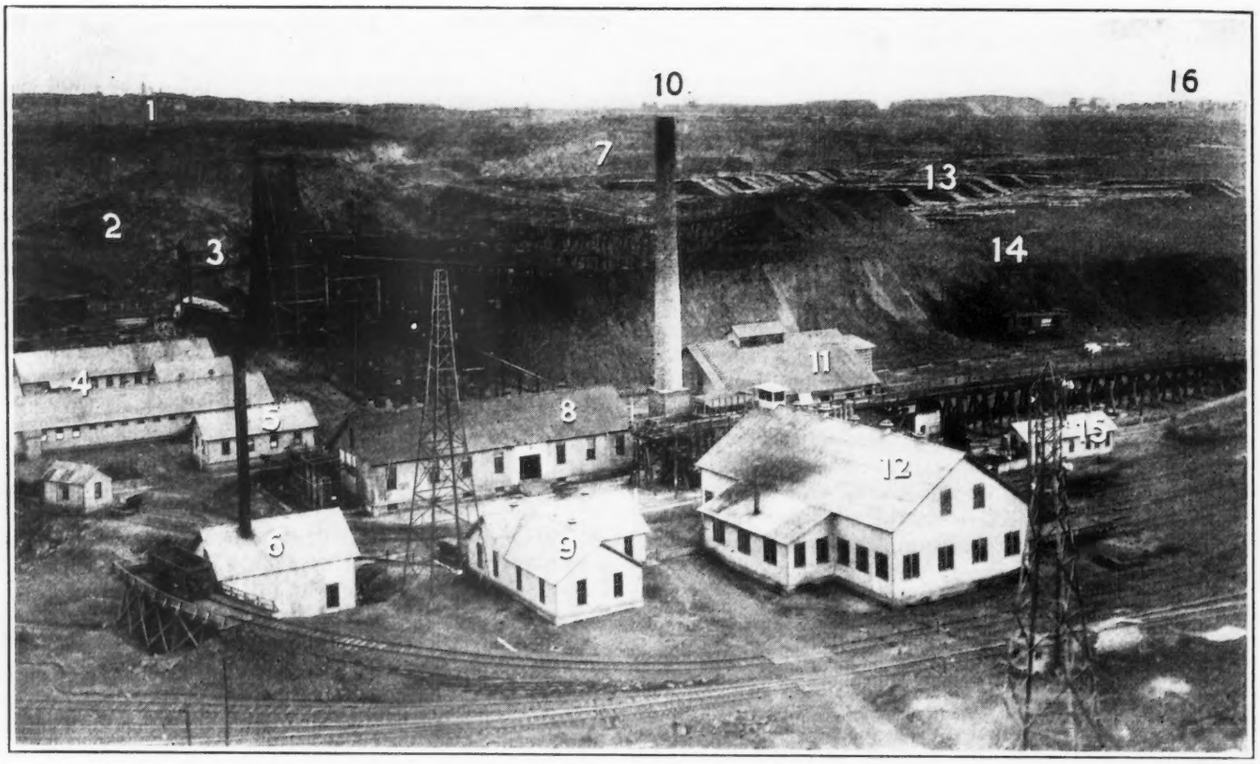
Power for the electrolytic tank house is delivered from the main substation, located adjacent to the tank house, which has a nominal full-load capacity of 232,000 amp. at 250 volts d.c.

The copper, as deposited in the tank house, is pulled in the form of cathodes, 3 ft. wide by 4 ft. long, which weigh an average of 150 lb. each. These are transported in two-ton lots on special cars running on a 30-in. railroad, hauled by electric storage-battery locomotives, to the smelter, or copper refinery, where they are charged into refining furnaces, of which there are three, each having a holding capacity of 300 tons of copper. The copper is melted down, slag skinned off, blown to pitch and poled with hardwood poles obtained from the south of Chile. Each furnace can take out a charge every twenty-four hours.

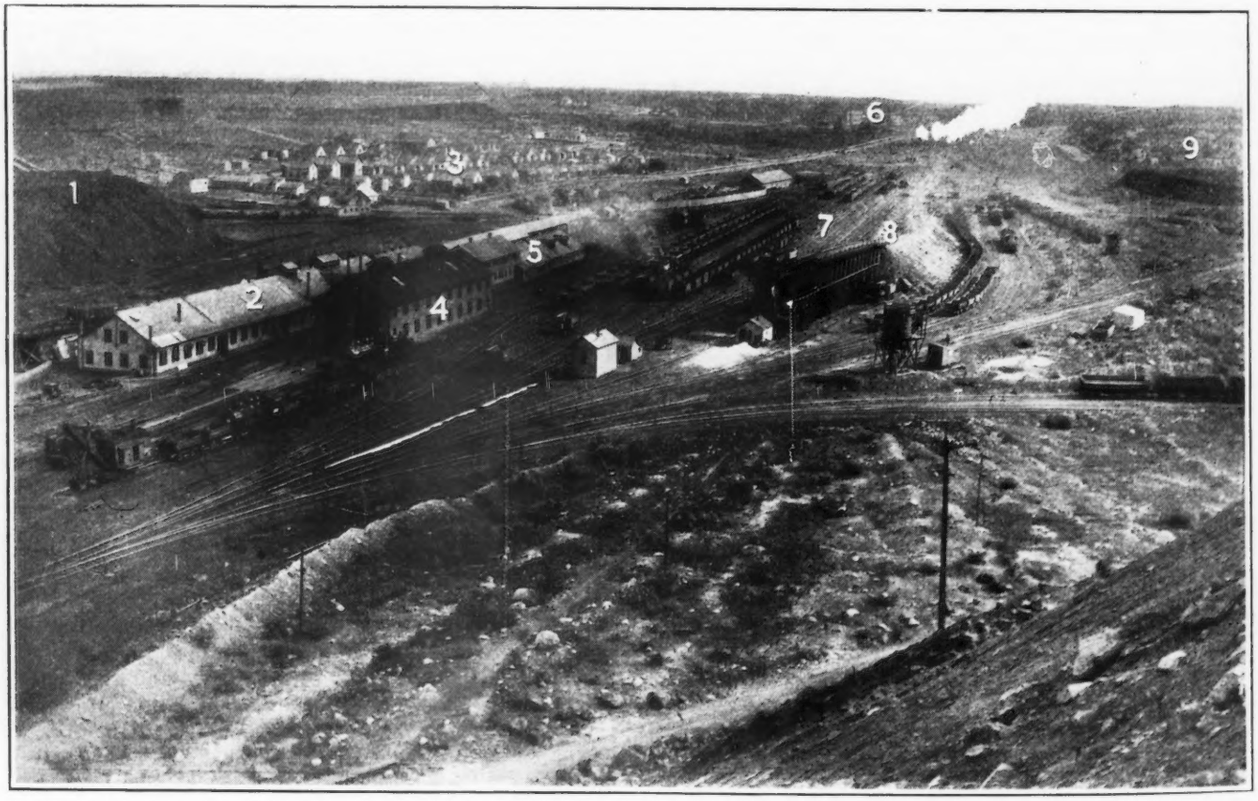
With the exception of steam locomotives already mentioned, which are being supplanted by electrics, the entire operations of the mine and mill are carried on with electric power generated in Tocopilla received over two transmission lines, which deliver power at 100,000 volts to Chuquicamata. This is stepped down and distributed through the plant and mine at 5,000 volts. However, practically all the motors throughout the plant operate at 500 volts, 50 cycle, 3 phase. There are 1,553 motors installed in Chuquicamata, with an aggregate horsepower of 157,852.

The reduction plant covers an area of 264 acres.

Surface Plant of the Leonidas Iron Mine, on the Mesabi Range



1, City of Eveleth, Minnesota. 2, Leonidas open pit. 3, Headframe, Leonidas shaft. 4, Change houses. 5, Office of mine captain. 6, Heating boiler house. 7, South Leonidas open pit. 8, Engine house. 9, Garage. 10, Spruce No. 4 shaft and boiler house. 11, Old boiler house. 12, Car repair shop. 13, Timber yard. 14, Stockpile. 15, Oil house. 16, Loyeville, Minn. The surface to the right of that seen here is shown in the view below.

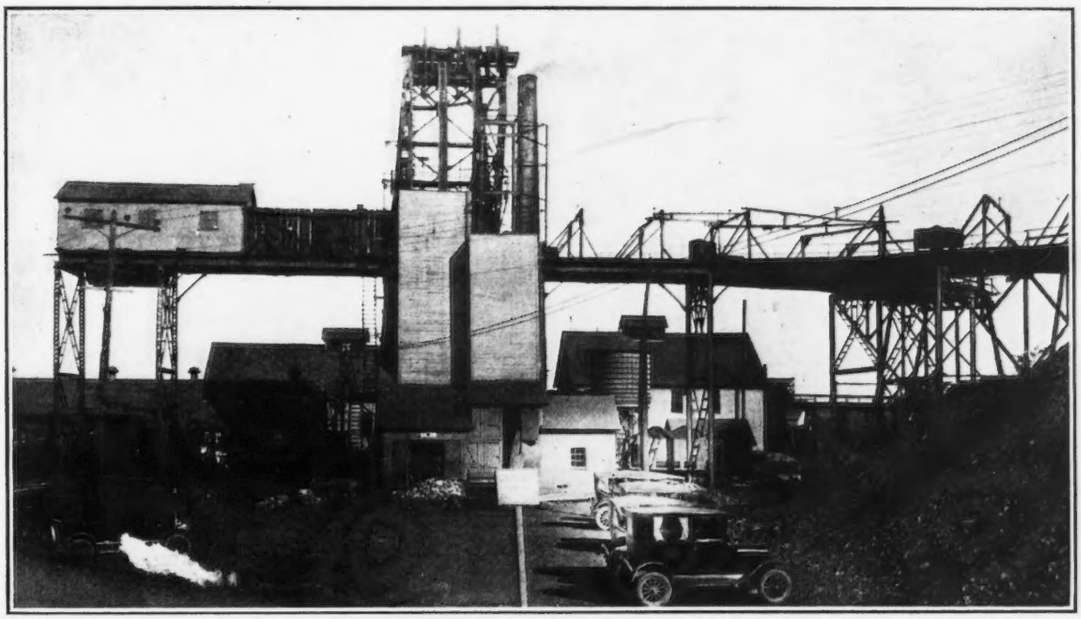


The portion of the plant that lies immediately to the right of that shown above is seen in this view. 1, Stockpile (the same as that shown in "14" above). 2, Machine shop. 3, North Leonidas location. 4, Locomotive repair shop. 5, Warehouse. 6, Leonidas school. 7, West Adams ore yards. 8, Coal dock. 9, South Leonidas location.

Electrifying the Spruce and Leonidas Iron Mines, on the Mesabi Range

RECENT YEARS have seen steady progress in electrifying iron-mining operations in the Lake Superior region. In one instance an open pit has been completely electrified with marked success, and it is undoubtedly but a matter of time before all pit shovels and locomotives are similarly operated. Likewise, at the underground mines on the ranges the change has been taking place and the history of electrical development can be read in the plants which in their equipment mark the stages of transition from steam to electric power.

The largest operator on the ranges is the Oliver Iron Mining Co., the iron-mining subsidiary of the U. S. Steel Corporation. Electrification of its properties has proceeded steadily. Last year saw the change from steam to electricity effected at its Spruce and Leonidas mines, which are situated at Eveleth, Minn., on the Mesabi. In the accompanying photographs the modern equipment that has been installed is shown, with some converted machines that serve as memorials of the transition.



No. 4 Shaft of Spruce underground mine at Eveleth. Stockpile trestle at right. Boiler house, engine room and miner's changehouse in background. The shaft is 408 ft. deep

It was the desire to secure the greater economy that could be obtained by operating electrically instead of by steam that led the Oliver company to make the change. The outcome has justified the course, for it is in the cost of producing power that the greatest saving has been made. Economy, however, is not the only thing that has been effected. The electrically operated plant runs more smoothly than the steam plant. In general appearance, also, the plant shows some improvement. Furthermore, electrification has given a greater degree of safety in operation than was had before, inasmuch as the new hoists are well equipped with safety controls.

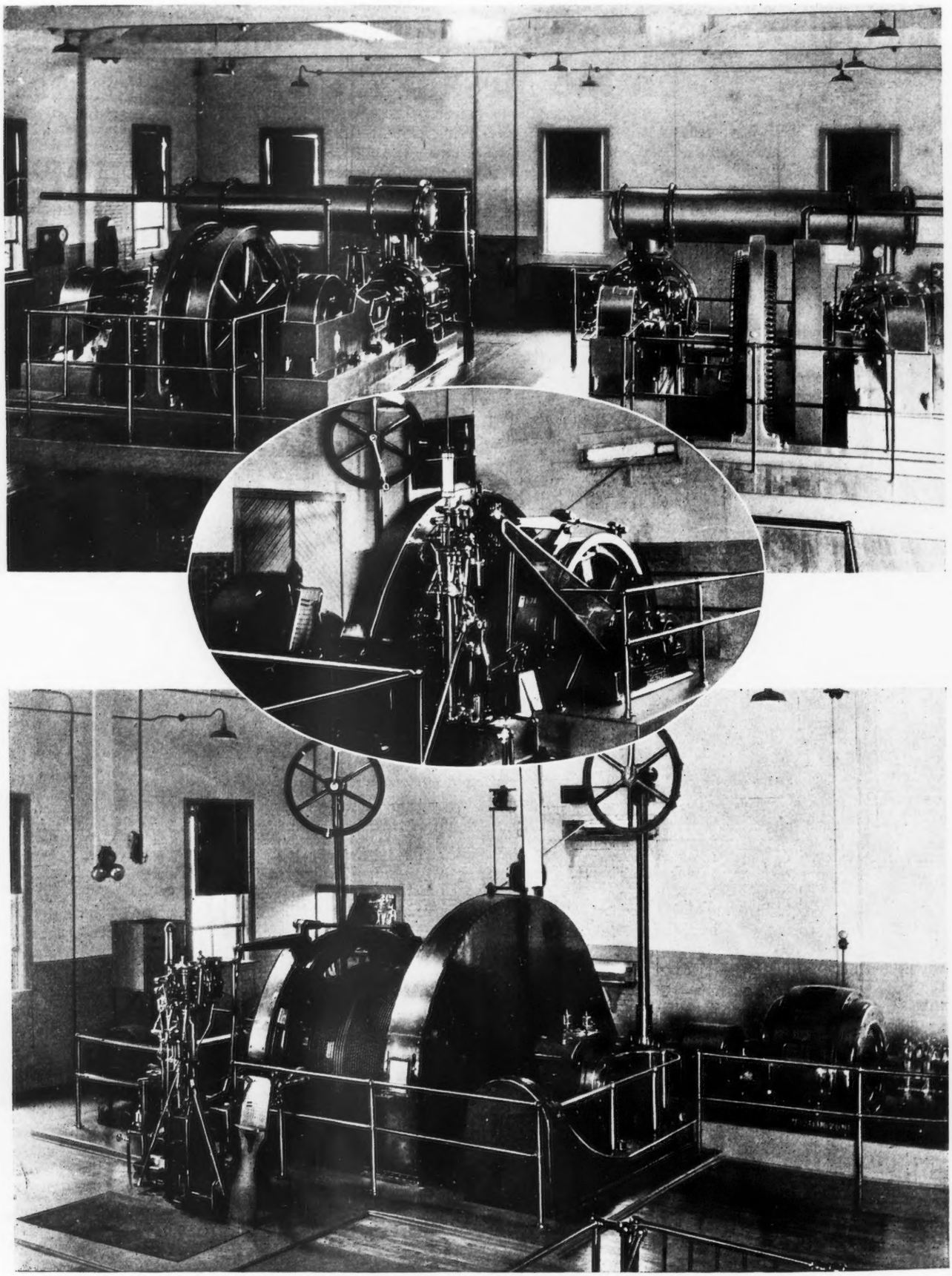
The only real problem that presented itself in making this change, according to the management, was that of maintaining operations at the underground mines while the change was in progress. Temporary hoisting plants, steam-driven and erected outside of the old ones, served the purpose.

At the Spruce the new compressor equipment consists of two 29-in. 18x21-in. duplex two-stage air compressors, having a capacity of 2,443 cu.ft. of actual free air per minute at 100 lb. gage and 180 r.p.m. These are each arranged for direct drive by a 450-hp. (50 deg. C. basis) synchronous motor, operating at 180 r.p.m., 460 volts, 3 phase, and 100 per cent power factor. Each is provided with a 15-kw.-125-volt motor-generator set.

Two steam hoists were remodeled for electric operation. The skip hoist originally was a 20x42-in. tandem first-motion hoist with a 6-ft. drum. The engines, steam piping, gears, and complementary parts were removed, the foundations remodeled, and new foundations built for the motor. A new herringbone gear and pinion and a flexible coupling were furnished. A 4½x3x10-in. brake engine and a Lilly controller were supplied. Safety devices against overwinding were provided in both headframe and engine house. A 400-hp. (40 deg. C.) 440-volt, 3-phase, 60-cycle motor and contactor control was selected for operation. The maximum hoisting depth is 420 ft. and the rope speed is 1,000 ft. per minute.

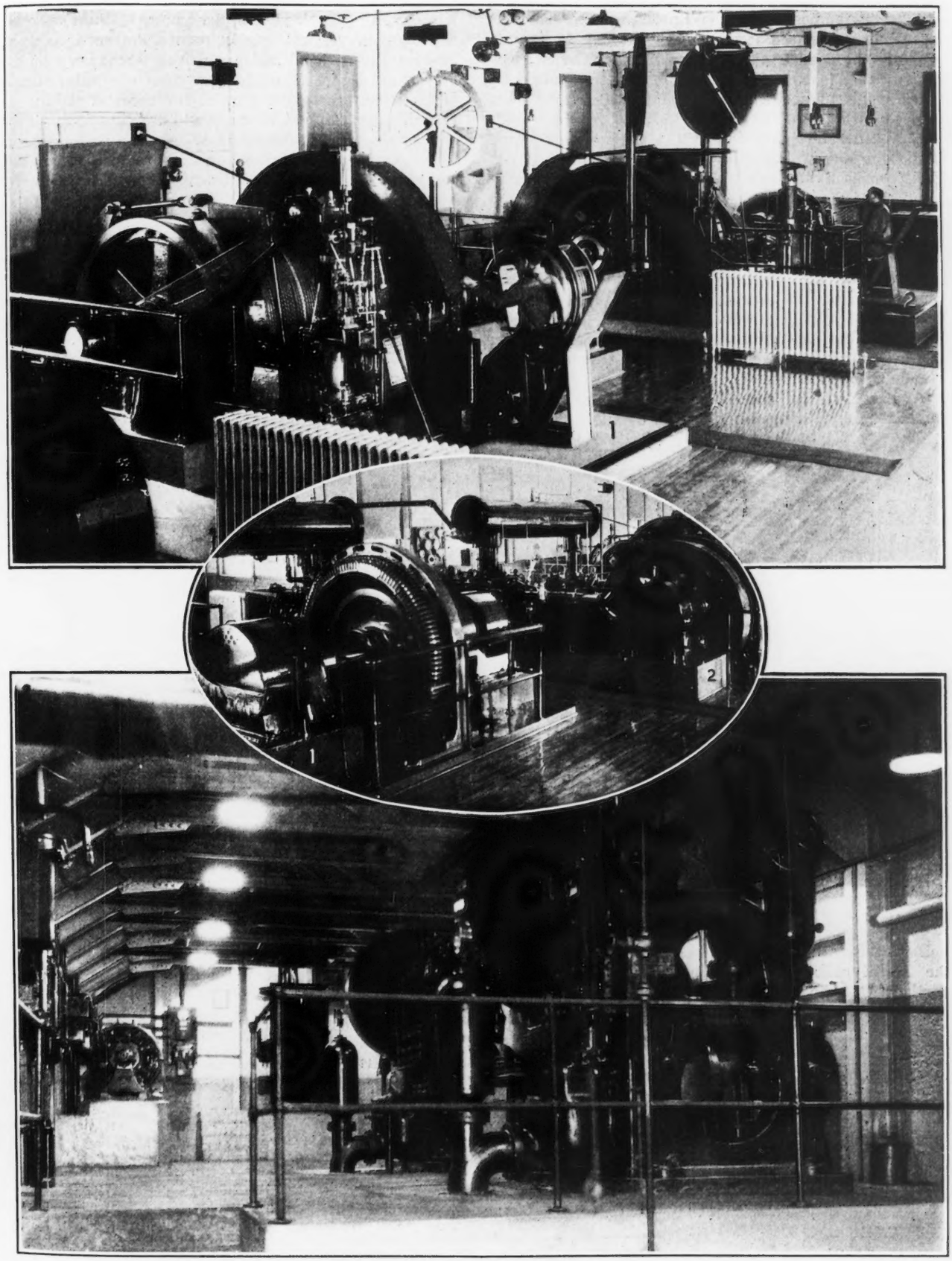
Similarly, the cage hoist was rebuilt and equipped for electric operation. In this case the motor used was a 200-hp. slip-ring induction motor and contactor control.

In the Spruce underground pumproom two 400-gal. single-acting vertical triplex pumps, arranged for motor drive, are provided. These are designed to work against a 750-ft. head. The plungers are 7¼x10 in. in dimensions, giving the capacity desired. The suction is 8 in. in diameter and the discharge 6 in. Each pump is driven by a 60-hp. (40 deg. C.) slip-ring induction motor. Its full load speed is 690 r.p.m. Herringbone gears and flexible couplings are used.



Plant at No. 4 Shaft of the Spruce Mine

Above, The compressor house with two 2,443-cu.ft. compressors, each driven by a 450-hp. motor at 180 r.p.m. In the oval, The cage hoist, a converted machine with a 6-ft. drum, driven by a 200-hp. motor. Below, The skip hoist, also a converted machine with a 6-ft. drum. Both hoists are equipped with Lilly control, a Duro air brake engine and herringbone gears.



The equipment at the Leonidas Mine

Above, The cage hoist (left) and skip hoist (right). The former is a converted machine, with a 6-ft. drum, and is driven by a 200-hp. motor. The skip hoist is new and is driven by a 400-hp. motor. Both are equipped with control, air brake engine and herringbone gears similar to those at Spruce plant. In the oval, (1) A converted two-stage compressor of 1,592 cu.ft. capacity, driven by a 350-hp. synchronous motor. (2) A new feather-valve two-stage compressor of 1,629-cu.ft. capacity, similarly driven. Bottom, The Leonidas underground pump room, with three 300-gal. 750-ft. head vertical triplex pumps for handling mine water; also two 250-gal. clear-water pumps.

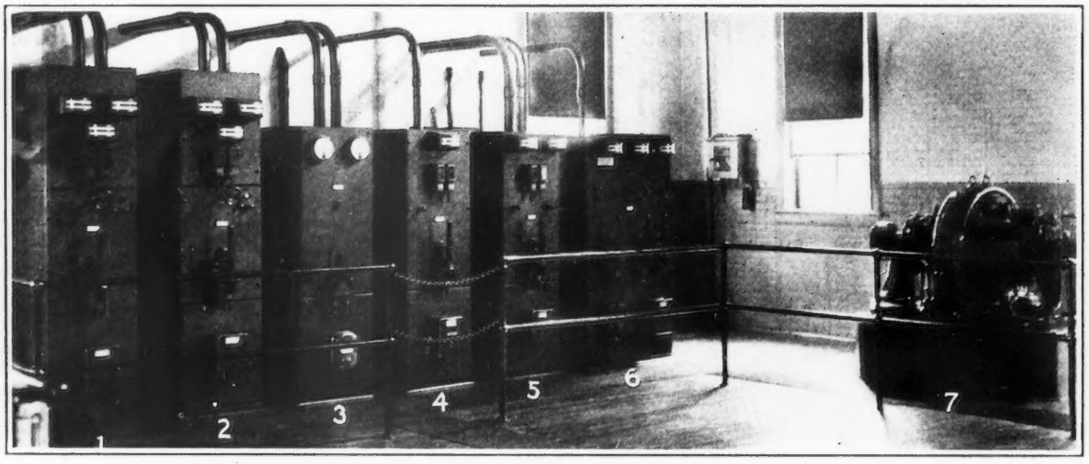
The switchboards in the Spruce engine house are shown in one of the accompanying views. At (1) and (2) are the dead front control panels for the two compressors. At (3) is the skip-hoist control panel. At (4) are the surface feeders, 200 amp., 440 volts, 3 phase, and at (5) the underground feeder. At (6) is the rotary converter panel and at (7) the converter itself. This is a 150-kw. machine with transformers and control, consisting of one 275-volt d.c. 1,200-r.p.m. compound-wound synchronous converter to be operated from a 480-volt, 3-phase, 60-cycle system. The transformers are 50 kva., 60 cycle, 480 volts primary and 206 volts secondary.

Power used at both the Spruce and Leonidas mines is purchased from the Minnesota Power & Light Co. It is transmitted at 22,000 volts and stepped down to 460 volts. At the substation at the Spruce there are three 500-kva. single-phase outdoor shell-type transformers of standard construction.

At the Leonidas mine the equipment is in general similar, though with differences in details. There, the pumproom is provided with five pumps. Three of these are 300-gal. vertical triplex pumps designed to work against 750-ft. head and are driven, each, by a 60-hp. 690-r.p.m. motor. The other two are clean-water pumps of the same type and design as the three already mentioned, but of 250-gal. capacity and drawing from different sumps. Each of these is driven by a 60-hp. motor. The rotary converter, shown in the view of the Leonidas pumproom, is a 150-kw., 1,200-r.p.m. machine, converting 208 volts a.c. to 275 volts d.c.

In the compressor plant one of the two machines is a two-stage compressor of a capacity of 1,592 cu.ft. of free air per minute. It is driven by a 350-hp. synchronous motor at 200 r.p.m. The other is a new feather-valve, two-stage compressor of 1,629 cu.ft. free-air capacity, connected to a 350-hp., 200-r.p.m. synchronous motor.

One of the hoists at the Leonidas—that on the cage—is a converted steam machine, now operated by a 200-hp. motor. The skip hoist is new. It is geared to a 400-hp. motor. Both hoists are equipped with Lilly control and herringbone-gear drive and have drums of 6-ft. diameter.



The switchboard at the Spruce Mine plant

1 and 2, Compressor control panels. 3, Skip hoist control panel. 4, Surface feeder, 200 amp., 440 volts, 3 phase. 5, Underground feeder. 6, Rotary converteer panel. 7, Rotary converter, 150 kw., 208 volts a.c. 275 volts d.c.

McIntyre Porcupine Mining Costs

During the nine-month period ended March 31, 1927, the McIntyre Porcupine Mines, Ltd., operating in northern Ontario, mined and milled 385,405 tons of ore with an average gold content of $8.08. The following table analyzes the cost for mining and gives other related operating data.

Detail of McIntyre Porcupine Mining Costs

	Stoping	Drifting	Cross-cutting	Railing	Stations and Sumps No. 11 Shaft	Sinking No. 11 Shaft	Total Cost	Cost per Ton
Labor	$359,412	$91,538.66	$41,633	$2,141	$10,160	$96,279	$601,165	$1.5598
Explosives	60,454	44,124.14	17,486	908	468	10,513	133,955	0.3476
Supplies	53,816	11,719.00	4,263	168	492	11,914	82,374	0.2137
Power	24,600	8,947.35	3,637	355	1,178	9,221	47,940	0.1244
Timbering	74,863	.....	3,623	.....	8,853	70,844	158,185	0.4105
Shaft repairs and alterations	3,369	.....	.....	.....	.....	345	3,715	0.0096
Steel sharpening	22,778	14,501.28	4,777	322	453	7,897	50,730	0.1316
Drill repairs	10,612	5,708.23	1,470	134	3	2,777	20,706	0.0537
Surveying and engineering	12,295	3,953.75	1,152	151	92	1,139	18,784	0.0487
Sampling and assaying	23,752	4,387.49	1,370	.....	.....	137	29,648	0.0769
Pumping and ventilating	13,062	.....	185	.....	190	6,025	19,463	0.0505
Tramming	40,362	7,369.06	2,205	80	.....	.....	50,017	0.1298
Surface tramming	.....	.....	1,376	.....	792	13,355	15,524	0.0403
Hoisting	68,191	12,531.04	8,039	130	2,631	39,463	130,987	0.3399
	$767,571	$204,780.00	$91,222	$4,393	$25,316	$269,915	$1,363,199	$3.5370
Less charged to undistributed development	.....	.....	30,209	.....	$25,316	$269,915	325,441	0.8444
	$767,571	$204,780.00	$61,012	$4,393	.....	.....	$1,037,757	$2.6926
Exploration	.....	.....	.....	.....	.....	.....	28,193	0.0732
							$1,065,951	$2.7658
Examination of prospects	.....	.....	.....	.....	.....	.....	8,661	0.0224
							$1,074,612	$2.7882
Unit cost per ton	$1.9916	$0.5313	$0.1583	$0.0114				

Minnesota Manganese Ores Offer Economic Possibilities

Federal and State Governments Co-operate to Evolve Efficient Metallurgical Methods of Treatment

SEVERAL YEARS' work done jointly by the U. S. Bureau of Mines and the Minnesota School of Mines Experiment Station at Minneapolis are summarized by T. L. Joseph and S. P. Kinney in Bulletin 12 of the University of Minnesota Experiment Station. The economic studies of low-grade manganese ores and manganiferous iron ore in relation to the iron and steel industry are well reported by these authors in this bulletin, as follows:

1. Manganese plays an important rôle in the present art of steel making, because it is a superior deoxidizer and adds desirable physical properties to the finished steel. A small part of the domestic requirements is consumed in making dry batteries and for miscellaneous chemicals. The major consumption, however, is in the form of ferromanganese ores. The present supply of domestic ores suitable for the production of ferromanganese is not in any way commensurate with the domestic requirements. Estimates of deposits indicate that the reserves of low-grade ores are more adequate. The manganiferous iron ores of the Cuyuna district, Minnesota, constitute an important part of the low-grade manganese ores. In undertaking the adaptation of these ores to the needs of the steel industry, the North Central Experiment Station of the Bureau of Mines, in co-operation with the Minnesota School of Mines Experiment Station, has been conducting an investigation of pyrometallurgical methods for making ferromanganese from the manganiferous iron ores of Minnesota, and because of the interest shown in the problem it seemed advisable to report the progress made.

2. Tests made with a six-ton furnace have proved that it is feasible to smelt an ore burden made up entirely of the brown type of manganiferous iron ores. The high alumina content of the ores, although it must be considered in burdening, does not seriously militate against the smelting of these ores. From the data obtained with the experimental furnace it is possible to predict the fuel consumption and recovery which might be expected with large furnaces and the types of slag which would give the best recoveries. About 150 tons of metal, containing about 12 per cent Mn, 4.5 per cent C, 0.25 per cent Si, 0.55 per cent P, and below 0.01 per cent S, is available for investigating the next step of the process, which is the separation of iron, manganese, and phosphorus. This will be accomplished by selective oxidation at high temperatures in types of furnaces similar to those used in the steel industry today. The products will be low-sulphur steel and a slag low in phosphorus, containing manganese and iron in proportions suitable for the production of ferromanganese. Small-scale tests have been made on this part of the investigation, and the results form the basis of design of larger furnaces which are now being erected. The results of this work will be reported later.

3. In addition to proving that the brown ores can be smelted without difficulty and providing metal for investigating the remaining steps of the process, considerable fundamental information has been obtained on the production of ferro-alloys in the blast furnace. The important factors discussed are slag basicity, effect of high alumina content, fuel consumption, and recovery. Inasmuch as the results of gas sampling have an application to the distribution of gas and solids in blast furnaces smelting iron ore, as well as manganese ores, a general discussion of this phase of the investigation has been included. Stock distribution in the experimental furnace produces a porous center and a dense periphery, characteristic of large furnaces. This would tend toward low carbon dioxide and high carbon monoxide in the center of the furnace. Gas samples, however, show the opposite condition, which is attributed to faster descent of the charge in the center as a result of combustion across the entire hearth area. With localized combustion in industrial furnaces, the stock moves faster along the walls in the bosh, and the effect is transmitted to higher levels in the furnace, depending upon furnace lines. The extent or degree to which more rapid descent in the bosh is transmitted to higher levels will also depend upon furnace lines.

4. With present methods of stock distribution which produce an open center and a dense periphery, excess gas flows through the center of the furnace. This decreases contact between gas and solid and tends to lower the efficiency of the furnace. From the viewpoint of lining renewals, present methods are justified. It is believed, however, that small and gradual changes toward a less porous center and a less dense periphery would increase the efficiency of the blast furnace. Further verification of this viewpoint is being sought by extending plant observations to additional furnaces.

How Competition Affects the Mining Industry

Mining, no less than manufacturing, is, according to the Department of Natural Resources of the Chamber of Commerce of the United States, subject to competition.

"With the growth and development of our industries," the department says, pointing out some of the problems confronting the mining industry, "there has come an intensified struggle between commodities for markets. The development of new uses and the demonstration of the adaptability of certain materials have broken down many barriers and enlarged the field so that we find competition between metals and between minerals—copper versus aluminum, nickel versus chromium, sulphur versus pyrite, zirconium oxide substituting for tin oxide in enamels, titanium oxide for zinc and lead oxides in pigments, Duco replacing mineral pigments, antimony substituting for tin in cable sheathings, chromite in place of magnesite for refractories. There is also competition between mine products and forest products—concrete and steel versus lumber and timber, gypsum board versus Celotex."

The mine owner is no longer merely interested in extracting metals and minerals from the earth as cheaply as possible but in finding new markets and in developing new uses for his products, it is asserted. He has to meet the attacks of organized competition, and few mine owners are strong enough to meet them successfully alone.

A Sketch of Mining in British Columbia

By T. A. Rickard

BRITISH COLUMBIA is an interesting part of the world, particularly to the mining engineer, on account of the diversity of its ore deposits, the manner of their occurrence, and the picturesque avenues by which they are reached. Usually the sources of mineral wealth are found in the waste places of the earth, in desert lands or on bare hillsides, where erosion has exposed them to the prospector, but in British Columbia the miner plies his pick amid scenery of rare beauty and finds his way along lordly rivers or over placid lakes that mirror the snow-crested mountains. It seems a region almost too lovely for profitable mining operations. Most of us know that such an inference is unwarranted, and if we have any lingering doubt it is dispelled by the Annual Report of the Minister of Mines for the year ending Dec. 31, 1926. The Minister is the Hon. William Sloan, who has ever shown the utmost courtesy and consideration to engineers and mine operators from our side of the line. His many friends in the United States will be sorry to learn that he is seriously ill at this time.

Credit for the compilation of statistical and other information contained in this yearbook is due to John D. Galloway, the Provincial Mineralogist and the head of the Bureau of Mines, at Victoria, the seat of government in British Columbia. Mr. Galloway was appointed to his present post two years ago in succession to a gentleman and an engineer, William Fleet Robinson, that gave distinction to the office of Provincial Mineralogist by twenty-five years of honorable and efficient service.

Steady Advancement Shown

In his general summary Mr. Galloway shows that the mineral industry of the province is prospering. In 1926 the output was valued at $67,188,842, of which 25 per cent is estimated to represent the proportion of profit; but, as usual, "profit" is an elastic term, only $10,000,000 being distributed in dividends, which, after all, are the only concrete form of profit that the shareholder understands. The gross output increased 9.2 per cent in value compared with the highest previous record, a year previous. Indeed, the mining industry of British Columbia has shown steady advancement since 1921, a year of acute depression, caused mainly by the low prices of the metals. The output for 1926 was nearly 2½ times that of five years ago. This surely is a noteworthy achievement. Of the total mineral output of the province since the beginning of mining operations fully half has been produced during the last twelve years. This is in accord with the recent history of mining in other parts of the world; we are consuming our mineral resources at a stupendous rate. Since 1900 the world has used more of its minerals than in all preceding time; that is, since the first use of metals, five thousand years ago; and the per capita consumption in the United States alone has been multiplied ten times within fifty years.

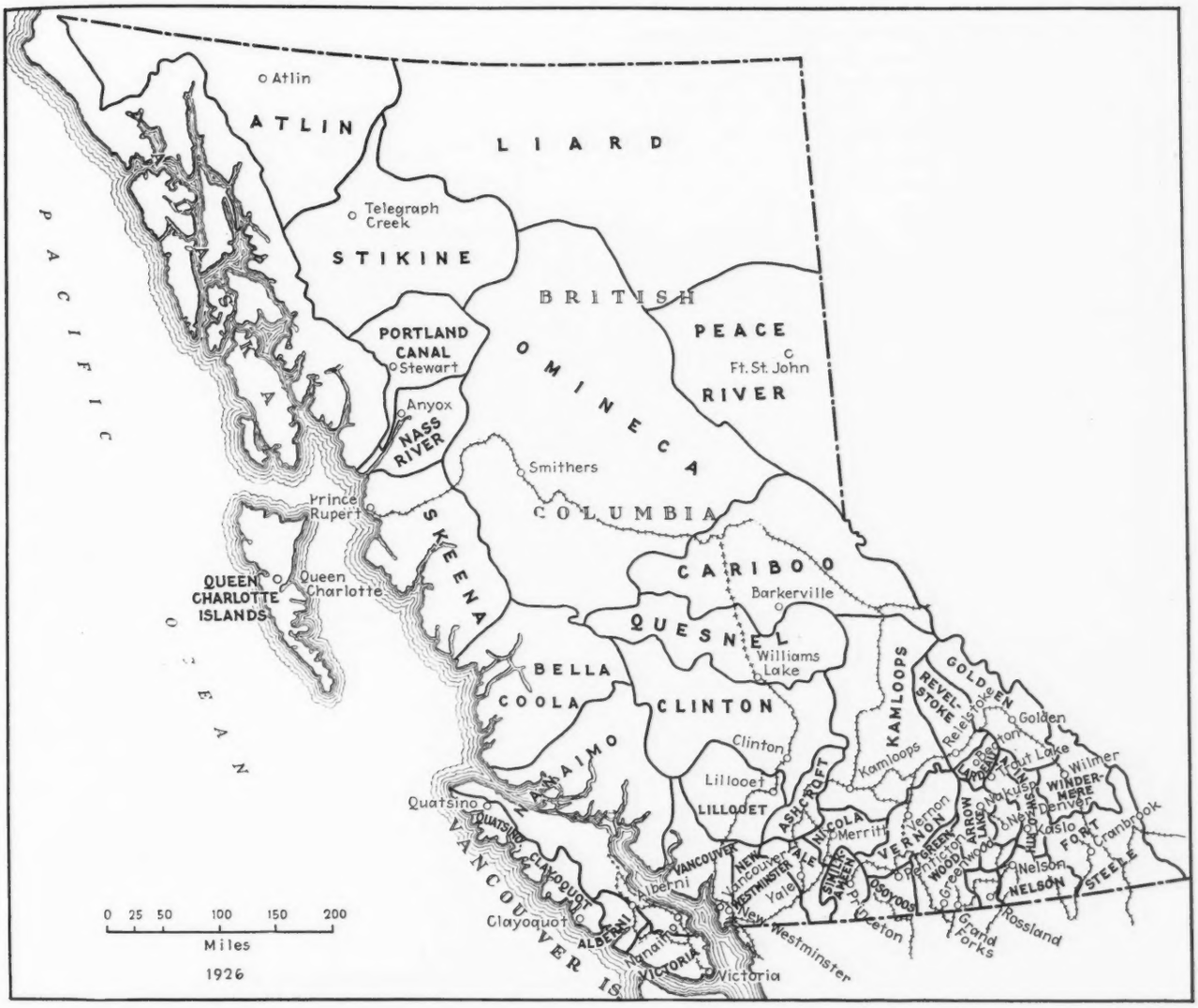
Of all the Canadian provinces, British Columbia is the largest producer of silver, having surpassed Ontario in this respect in 1926, with an output of 10,748,536 oz., valued at $6,675,606, which was about a million ounces more than the production of Ontario, now the most promising, and destined soon to be the most productive, gold region in the world. The increased silver output of British Columbia is to be credited to the Sullivan mine, of the Consolidated Mining & Smelting Co. of Canada, in the Fort Steele district. This silver is a byproduct in the beneficiation of a complex zinc-lead ore. Of the total silver output 4,942,364 oz. are credited to the Sullivan and 2,920,492 oz. to the Premier mine, in the Portland Canal district.

Gold mining is not as important as it used to be in the days when the finding of rich placers first brought the prospector to British Columbia. It was in 1857 that the finding of gold in the gravel of the Fraser River started the first rush to the diggings. That led to the development of the Cariboo district, which still yields most of the placer gold that is won in British Columbia. In 1926, however, the total output of placer gold was only $355,503, contributed by the Atlin, Quesnel and Cariboo districts. The gold from rock in place—that is, from lodes and veins—amounted to $4,163,859, a decrease of 4 per cent compared with 1925. Of the total the Portland Canal division produced 6½ per cent, and of this the Premier mine by itself contributed 122,228 oz., which represents half of the British Columbia gold output. Most of the remainder is a byproduct in the winning of the base (a poor epithet, but conventional; perhaps "useful" would be better) metals.

One gold mine deserves special mention; and that is the Nickel Plate, of the Hedley Gold Mining Co., in the Similkameen division, in the Boundary region. This old mine is being kept alive not only by its own vitality but by that of its manager, Gomer P. Jones, who represents the Marcus P. Daly estate, the owner. Mr. Jones is developing the Nelson, a prospect near by, in the hope of redressing the balance of the old property with which his name has been so long and so honorably identified. The Surf Inlet mine, of the Belmont company, was closed down, on account of the depletion of the known orebodies, after having paid $1,437,500 in dividends since the beginning of operations in 1916. It was the decrease in production at this mine that was the chief cause of a diminution, 4 per cent, in the gold output of British Columbia last year.

Sullivan Mine Finally "Arrives"

The copper production of the province amounted in 1926 to 89,339,768 lb., valued at $12,324,421. The increase (23½ per cent) was due to the larger output of the Copper Mountain mine of the Granby company and to a small gain on the part of the Britannia, on Howe Sound. Lead was produced to the amount of 263,023,937 lb., valued at $17,757,535, the increase (10½ per cent) being due chiefly to the Sullivan mine, which also was the chief factor in augmenting the zinc output 45½ per cent, to 142,876,947 lb, valued at $10,586,610. Indeed, the Sullivan fills a large part of the picture of mining in British Columbia today. This great mine, at Kimberley, in the East Kootenay, has come to fruition after many years of laborious metallurgical cultivation. The mine was first opened up in 1888, when it was operated by aid of a small lead smelter erected by a local company that soon went bankrupt. Subsequently some resourceful gentlemen of Spokane spent a good deal of money unsuccessfully in the effort to make the mine pay. The ore



Mining districts of British Columbia, showing (circles) the mine registration offices, and railroads

was too complex for them, and even for the present owners, the Consolidated Mining & Smelting Co. of Canada, until the aid of selective flotation enabled a profitable separation to be made of the blende from the galena, and of both from the pyrite and pyrrhotite. A zinc (48-50 per cent) concentrate and a lead (70 per cent) concentrate are made, the ultimate refining being completed at the Trail smelter. The output of ore from the Sullivan is now 4,000 tons daily, and a further increase to 5,000 tons can be made when the milling and smelting capacities of the respective plants are expanded proportionately. a matter dependent directly upon a further supply of electric power.

For the future of the metal industry in the province it may be said that signs of a further revival of gold mining are manifest in the Bridge River and Cariboo districts. At least ten small properties of a promising character are recognizable in the Slocan district, their development giving expectation in the next two or three years of an increased production of silver, lead, and zinc, but, statistically, their contribution to the metal markets will be overshadowed, if not eclipsed. by that of the Sullivan mine. In the Portland Canal district half a dozen good-looking prospects give promise of becoming noteworthy mines. The hope of an increased output of copper hinges upon the Coast Copper Co.'s mines at Quatsino, on Vancouver Island, and on the Sunloch mines, near the Jordan River, only 30 miles from Victoria.

Coal mining proceeds in leisurely, if not precarious, fashion. The business of digging coal is dependent largely upon the weather—that is, upon the local demand for fuel. Coal mining, as an industry in British Columbia, has been hit hard by the cheap oil coming from California and Peru during the last decade. There is no probability of an expansion of the coal business in the province unless an export demand provides the necessary stimulus. The technique of coal digging is still backward. New ideas are required, and they are checked by the incidence of the Coal Mines Regulation Act, which deters the entrance of technically trained young men into this field of industrial activity.

In British Columbia, as in western North America generally, one notices the change in the composition of the labor employed in the mines. In Arizona, for example, the Mexican is now predominant. Forty years ago

the Cornish, the Irish, and the American-born white laborer were dominant among the workers underground; they were succeeded by Finns and Scandinavians, who were largely displaced by Italians. Then came the people of the Near East, chiefly Slavonic, Montenegrins, Serbs, and Austrians; and now Czechoslovaks, Spanish, and Mexican. Broadly speaking, the hereditary miner has disappeared; his place has been taken by the mere laborer, whose lack of training has been overcome by the use of increasingly effective machines for drilling, breaking, and moving the ore. In British Columbia the change has not been completed, fortunately, the old stock surviving to a notable extent. Thus at the Premier mine 35 per cent of the labor force was British in 1924 (the latest year for which such statistics are available) and 18 per cent was Canadian. Men from the United States composed a quota of 7½ per cent and Italians 3½ per cent. Scandinavians and Slavs (chiefly Russian) each contributed 10 per cent. The 3.8 per cent of Japs represented cooks and helpers, not real miners or even mine laborers. At the Anyox plant of the Granby company, 27 per cent were British and 24 per cent Canadian, American 4 per cent, Swede 9 per cent, Italian 6 per cent, and from 2 to 5 per cent of Russian, Finn, German, Norwegian, Ukranian, Polish, and Australian. At the Surf Inlet mine the British represented 46 per cent and the Canadian 23 per cent, with only 5 per cent American, 7 per cent Swede, 4 per cent Norwegian, 4 per cent Finn, and 2 per cent Polish. Thus, on average, one may say that fully 50 per cent of the mine workers are British and Canadian. In the coal mines, Oriental labor is noteworthy. Thus at the Nanaimo mine, of the Western Fuel Co., 135 Chinese are found among 1,394 workers, or about 10 per cent.

American Capital Attracted

American capital continues to be conspicuous in the mining enterprise of the province; it controls the Premier, Granby, and Britannia mining companies. Canadian capital controls the Consolidated Mining & Smelting Co., which owns the Sullivan mine, the Trail smelter, and many other properties, including the power plant at the Bonnington Falls. Of the Consolidated company's shares, the Canadian Pacific Railway owns 43 per cent, which, with sundry individuals connected with the C.P.R., gives the control. The B. C. Silver Mines, Ltd., operating in the Salmon River, or Portland Canal, district, is English-owned to the extent of 60 per cent, and 38 per cent is owned by the Premier Gold Mining Co., Ltd., which, by the way, has paid $10,150,000 since 1921. In the Slocan district a number of small mines, such as the Silversmith, Lucky Jim, and Florence, are controlled and operated from Spokane. The Blue Bell, at Riondel, was a French enterprise at one time, but it is now in the hands of its long-time manager, S. S. Fowler—one of the honored veterans of our profession—and of his business associates. The people of the province are friendly to American participation in their mining developments, and nobody has expressed that friendly feeling more consistently than the Minister for Mines, Mr. Sloan. Among British ventures, I may mention the Victoria Syndicate, of London, which, under the able guidance of R. H. Stewart, formerly manager for the Consolidated Mining & Smelting Co., is now developing five promising properties in the province. Another British company, the Porcupine Development and Finance Goldfields Consolidated Co. (an awkwardly long name, is it not?), is engaged in similar useful work under the leadership of another able engineer, Frederic R. Weekes, formerly manager for the Canada Copper Corporation of New York, but now domiciled at Toronto.

The subject of the exportation of crude metal and concentrate to smelters and refineries outside British Columbia is discussed by Mr. Galloway in this report. Of the total metallic mineral production of $51,863,534, nearly 72 was reduced to refined metal within the province. Suggestions, or dreams, of the establishment of a large copper refinery on the coast of British Columbia have been outlined many times, but the business affiliations of the American-owned mines in the province with refineries in the United States have prevented anything being done in a large way. The blister copper made by the Granby goes to the Tacoma refinery, and the silver bullion of the Premier to the Selby smelter, near San Francisco. Of the lead and zinc refined at the Trail smelter, 25 per cent is marketed in Canada, the remainder being sold on the basis of London prices, much of it going direct to the Orient from Vancouver, on a London settlement; for London is still the dominant world's market for lead and zinc, the New York price being affected by import duties. One simple reason for the shipment of blister copper from British Columbia to American refineries is the fact that the saving in weight, as compared with the refined metal, is only 2 per cent, and lower freight rates are granted on the unrefined product.

Mention may be made here of another kind of refinery, the educational. The chief mining school in the province is at the University of British Columbia, at Vancouver. Prof. R. W. Brock is dean of the mining faculty. J. M. Turnbull is professor of mining, and S. J. Schofield gives an excellent geological course. Only from eight to ten students are graduated annually, which is not enough to meet the demand for such men in the province.

Mining Congress Delegates' Itinerary

In September the Empire Mining Congress is to make an excursion to British Columbia, on which occasion about 350 visitors from England and eastern Canada are expected to make a journey of observation. They will come first to the Kootenay, where the Sullivan mine, at Kimberley and the coal mines of Fernie will engage their attention. Thence they will go to the smelter at Trail, a metallurgic plant remarkable for the fact that there five metals (gold, silver, copper, lead, and zinc) can be seen in process of electrolytic refining. A plant is now being built to recover the cadmium that is associated with the Sullivan zinc; and it is proposed also to make high-grade steel by electric smelting. The iron is the residue from the zinc operations. This project is delayed only by insufficiency of electric power. From the smelter the party will go to Princeton, to see the Copper Mountain mine, and thence direct to Victoria, where, on Sept. 14, a day will be spent before proceeding to the Britannia mine, on Howe Sound. Two days will then be given to Vancouver, where the party will divide, some going to Jasper Park and others to Anyox. To these and other visitors I can say sincerely that they will enjoy their visit to British Columbia; for, as I have said once before, I believe, the people of that province have three attractive characteristics: they say "Thank you," their women have nicely modulated voices, and their men offer you a drink, all of which constitute, I submit, evidence of a highly advanced stage of civilization—in fact, there is nothing B.C. about British Columbia!

Discussion

Sam McMaster and the Homestake

THE EDITOR:

Sir—It was with a great deal of interest that I recently read the article by Francis Church Lincoln, professor of mining, South Dakota State School of Mines, Rapid City, S. D., entitled "Half a Century of Mining in the Black Hills," which was published in your issue of Aug. 7, 1926. My interest was excited first because of a general professional interest that must be felt by all mining engineers in the history of mining operations on a large scale; second, for the reason that Sam McMaster, first superintendent of the Homestake mine, was a personal friend of mine from 1877 until his death in 1885; and third, because while I was commissioned as a deputy sheriff for Lawrence County, S. D., I was detailed for about two years on special work for McMaster, to whom I reported directly.

For the above reasons I feel that I am able to speak authoritatively with regard to some matters connected with the earliest history of the Homestake mine, and particularly of the career of McMaster, on whose report the property was purchased and under whose management it was developed from a prospect to a dividend-paying property.

Although Mr. Lincoln's article deals in detail with the general history, development, and present condition of the Homestake mine, and in these particulars states the actual facts, yet in my opinion it is open to criticism because he fails to give McMaster credit for the part he played as the one responsible for its purchase and, after its purchase, for its development and operation from 1877 until his death, in 1885.

May I direct attention to some facts regarding the career of McMaster that were omitted from Mr. Lincoln's article. McMaster was sent into the Black Hills in the spring of 1877 under instructions from a San Francisco syndicate composed of J. B. Haggin, Lloyd Tevis, and George Hearst, to report on a silver mine owned by Robert Floorman, situated in Galena Camp about 15 miles from Deadwood. This mine was then attracting attention because much of the ore carried more than 1,000 oz. of silver to the ton, and was producing a sufficiently large tonnage of this high-grade ore to warrant transportation by mule and ox teams to Sidney, Neb., a distance of about 270 miles, where it was transferred to the Union Pacific Railroad and hauled to the nearest smelter for treatment. McMaster's examination resulted in an adverse report, but at the same time his attention was directed to free-milling gold ores on claims including the original Homestake claims at the head of Gold Run Gulch, in the Lead Camp, in the Whitewood mining district, about 4 miles from Deadwood.

At this time the original owners of the claims were treating surface ores in an arrastre. The claims had been staked by H. B. Young, a merchant of Deadwood, in the fall of 1876, for which the owners had deeded to Young an undivided 10 ft. in width through the entire length of the claims.

After a careful examination had been made of the claims owned by the Manuel brothers, Alec Engh, and Johnny Flaherty, the original Homestake claim, together with the Golden Star, adjoining, was purchased for a cash payment of $10,000 to each partner. It is interesting to note that this money was used wisely by the recipients in the following manners: Manuel brothers returned to their Eastern home, where they established a bank; Alec Engh, who had received his quarter interest in return for sinking a shaft 60 ft. deep on one of the claims, invested in a farm in the neighborhood of the Spearfish Valley, which he cultivated and improved to such a state of perfection that his place was recognized as about the best and most profitable farm in the entire Black Hills; Johnny Flaherty, a wild Irishman, invested his stake, but a few years later died in an insane asylum.

The undivided 10 ft. owned by Young was not acquired until later, in fact not until after the Homestake Mining Co. was organized, when he sold for $20,000 cash, making the total cost of the two claims to the Californians $60,000 cash.

It is at this point that, in my opinion, Sam McMaster showed a judgment and foresight far beyond such qualities shown by any other mining operator of that day, now fifty years ago. In spite of severe criticism by many of the leading mining engineers in California at the time, who predicted that if he was let alone he would break the Bank of California with the extensive deposit of low-grade ore that he had purchased, the results after half a century have proven that he is entitled to the credit of being the pioneer of pioneers in operating extensive deposits of low-grade ore in preference to smaller but richer bodies. In a word, he was really the originator of the policy by which mining operations conducted on an extensive scale are practically taken out of the ranks of speculative businesses and placed in the industrial column. Within less than two years under his management he developed a raw prospect of gold-bearing quartz ore, carrying values considered at that time as ridiculously low, into a dividend-paying mine.

From the time he made the purchase until 1878 he confined his operations to development work, to determine the extent of the orebody and the capacity of a mill most advisable under the circumstances, and decided on making a start by erecting an eighty-stamp mill with a capacity to treat approximately 400 tons daily. At that time the "old Homestake mill," as it was known, represented the greatest number of stamps operating under one roof.

When it is recalled that the average value carried by the ore treated in this mill was about $5 per ton in free gold, also that all the machinery sent from San Francisco to either Cheyenne, Wyo., or Sidney, Neb., and was hauled from one of these points by mule and

ox teams to Lead City, a distance of over 300 miles from Cheyenne, and almost as far from Sidney, the faith and enterprise possessed by Haggin, Tevis, and Hearst in following McMaster's advice stands out today, a half a century later, as one of the most monumental displays of courage and enterprise ever exhibited in the mining industry.

In those days the manager of such an enterprise as McMaster had developed was required to be not only well posted in his business but also a man of exceptional courage as well as of an autocratic disposition, for he not only had to operate the mine but also to watch the interests of the company with regard to litigation brought by adverse claimants against nearly every mining claim purchased after the first ones were acquired.

To give the reader an intelligible idea of some of the difficulties McMaster had to contend with, I will briefly narrate two, the first of which brought me in closer contact with him for one night's experience than would probably have happened in a whole year's acquaintance.

It was when the excavation was started for the foundation of the Golden Star mill in 1879, when a large gang of laborers under the superintendence of Angus McMaster (not related in any way to Sam) were employed, that during the lunch hour a party of adverse claimants jumped the site and started to sink a shaft. Some such action had been anticipated by McMaster because of threats that had been made, and in order to cope with the situation three men armed with shotguns had been detailed to occupy a cabin that overlooked the mill-site, such action being taken because, owing to the absence of Judge Moody, the U. S. District Court judge, no court action could be obtained.

On the return of the laborers from lunch the threatening attitude of the jumpers was met by a volley fired from the cabin, which resulted in the wounding of an onlooker, a clerk in a clothing store, who was struck in the cheek with part of a charge of birdshot, which resulted in his death a week later. The immediate result that followed the shots from the cabin approached the proportions of a riot, but on the arrival of Johnny Manning, the sheriff, with a small posse of deputies, the men who had occupied the cabin were arrested and taken to the Deadwood jail by Manning himself, who, because of the threatening attitude assumed by the claim jumpers and by many sympathizers among the miners, business men, and others, had concluded that it was advisable to have the company's property patrolled to prevent any depredations by a turbulent mob. Consequently ten well-known gunmen were sworn in as special deputy sheriffs to reinforce the small number of regular deputies. During Manning's temporary absence I was instructed as acting sheriff to report to McMaster in the eighty-stamp mill every half hour with regard to conditions.

Many false stories were told afterward relative to McMaster's whereabouts during that night, but I personally knew that these were untrue, because every thirty minutes from about 6 o'clock in the evening until 4 o'clock the following morning, when apparently all danger had passed, I found him in the mill, which was kept running by a selected number of employees of proven loyalty to the company. Every one of these men stood ready during the night to assist in defending the danger point, which was close to the engine room of the mill, where a pile of approximately a hundred cords of wood, fuel for the boilers, was stacked. Much of this wood was of pitch-pine variety, and if fire had been started, as was threatened several times during the night, the result would have been disastrous in the extreme, but fortunately such a catastrophe was averted chiefly because of the level-headedness of many of the employees of the company.

The later results were the indictment and trial of the three men for murder. They were defended by Colonel Parker, an eminent criminal lawyer, and after the jury brought in a verdict of acquittal, Judge Moody discharged the members of the jury in a short but memorable address, the closing words of which were: "Gentlemen of the jury, you are discharged from further consideration of this case, also from further attendance on court, and Mr. Clerk, as long as I am judge on this bench, it is my instructions that no member of this jury shall be summoned as a juryman in any case, for in bringing in the verdict you have just brought in you show that you are no better than a lot of pagan Indians. You can go and I shall be glad if I never see your faces any more."

Another incident that showed McMaster's capacity as a manager was with regard to the water supply necessary for the operations of the company. The Homestake Mining Co. at that time owned no water rights and was dependent on outside owners of ditch and water rights from whom the company had to purchase the quantity required on the basis of payment by the miner's inch. The main sources of water were Whitewood and Spearfish creeks, on which water rights had been filed by John Belding, Kirk Phillips, and others previous to the purchase of the Homestake claims by McMaster. This condition created a difficulty that required tact and prompt action to overcome, especially after the De Smet Mining Co. had purchased the mine of that name, in which the orebody was much less extensive than the Homestake, but carried higher values.

Soon after the mining property was purchased, McMaster quietly started to acquire several of these water rights from the individual owners and to amalgamate them into a separate company. He was so successful that, in 1880, when the City of Deadwood proposed to grant a charter for supplying it with water for a fifty-year franchise to be decided by an election by the voters, at which election the Homestake interests were opposed by the interests of the De Smet Mining Co., which had also acquired several individual water rights, the Homestake interests won the election. That election day was a memorable one in the annals of the Black Hills, because the occasion was looked upon by many voters as being one when the biggest purse would win out. Consequently, a vast number went to the polls prepared to sell their votes to the highest bidder without any consideration as to principle involved.

It appears to me that there could be no more fitting time than the fiftieth anniversary of the organization of the Homestake Mining Co. to record the fact that it was on Sam McMaster's advice that the property was originally purchased, and during his term of office as the first superintendent that the holdings of the company were increased from two small prospects to practically the present area. He also placed the company on a dividend-paying basis within two years and is entitled to rank as the pioneer of pioneers and the originator of the scheme of mining extensive low-grade ore deposits.

WILLIAM M. BREWER.
Victoria, B. C.

News of the Week

Summary

SIX POTASH MINERALS are identified in the core taken from the second hole drilled by the U. S. Bureau of Mines on public lands in New Mexico.

Treadwell Yukon Co. issues an annual report containing details concerning the Errington group of properties in Ontario, Canada, now being explored by the Treadwell Yukon Co., Ltd.

E. E. Barker states in a preliminary report which has recently been received in Australia that the proposed open-cut method of mining the Mount Morgan ore deposits cannot be applied profitably.

Stockholders of the North Butte Co. appoint a protective committee to investigate the proceedings which have plunged the company into receivership.

Shattuck Denn lead concentrator at Bisbee, Ariz., is closed for an indefinite period.

Amalgamation of seven Western Australia gold mines into two groups specially financed is recommended by a Commonwealth commission.

Belmont Copper Mining Co. completes arrangements to take over fractional interests held by the Calumet & Arizona Mining Co. in three patented mining claims near Superior, Ariz.

Russo-Asiatic Consolidated issues report on the zinc-lead properties of the Compagnie Nouvelle des Mines de Villemagne and the Mines de St. Sebastien d'Aigrefeuille, which it controls.

According to a report in London, a portion of the Panama Corporation's property is giving such encouraging results that it will be financed as a separate undertaking.

Gold production of California drops 9 per cent for the year 1926 in comparison with 1925 production.

Amalgamation Into Groups Advised For Gold Mining Companies of Australia

Commonwealth Commission, in Its Report, Makes Recommendations for Many Changes in the Industry, Based on Investigations of Technical Committee

By Peter G. Tait

Special Melbourne Correspondent

AN INTERIM REPORT by the Commonwealth of Australia Development and Migration Commission on the gold-mining industry in Australia, which deals particularly with the Western Australian districts at Kalgoorlie and Leonora, has recently been published. The chairman, H. W. Gepp, in introducing the report, states that the commission hopes that as a result of a careful survey of: (1) the economics of the production of gold in Australia; (2) the possibilities and probabilities of the extended application of the best scientific and technical skill in the treatment of the known deposits in Australia and (3) the possible discovery of further deposits, the industry of gold production in the commonwealth can be developed, with lasting benefit to the commonwealth as a whole. Vitally related and interwoven is the ever-present problem of maintaining satisfactory industrial relations between all sections of the industry, based upon mutual confidence, respect, and understanding.

The report is based largely on the investigations of a technical committee, appointed last October, consisting of W. E. Wainwright (Broken Hill), A. J. Gibson (Sydney), C. H. J. Clayton (Broken Hill), and A. W. Hutchin (Hobart). The main conclusion of the commission is that there should be an amalgamation of the seven mines now operating into two groups, each treating 25,000 tons per month, a western group comprising the Great Boulder Proprietary, Lake View and Star, and the Golden Horseshoe Estates, and an eastern group consisting of the Associated, Boulder Perseverance, South Kalgurli Consolidated, and the Oroya Links. For various reasons the amalgamation of the second group of mines into one organization is not so simple as in the first case, but the report suggests that, if the first group were amalgamated, the second group would follow the example at a later date. The western group has the advantage in that the Lake View and Star possesses a modern mill, whereas the eastern group does not include any treatment

Mine plants of the Golden Horseshoe (left) and the Great Boulder Proprietary (right), in the Kalgoorlie district, Western Australia

plant capable of serving as a nucleus for extension. Two mines on the eastern side—namely, the South Kalgurli and the Boulder Perseverance—are still operating at a profit.

"There are sufficient known ore reserves on the properties of the mines comprising the western end of the field," says the report, "to insure profitable operation of an efficient mill for a period of three to five years. The existence of a good mill on the Lake View and Star property, in the western end, presents a favorable feature. This mill could be extended at a moderate cost to treat sufficient ore to yield a profit of perhaps 5s. a ton exclusive of development costs over the period of the next few years. Extensions effected to the Lake View mill in accordance with the recommendations of the commission would enable 25,000 tons per month from the amalgamated mines to be treated. Assuming the above-mentioned profit of 5s. per ton, this would represent a profit of £6,000 per month, or £72,000 per annum for the period indicated.

"It is, however, certain that considerable saving can be made, and should ore development warrant the necessary expenditure, both underground and on the surface, this working cost figure 25s. per ton is by no means unattainable." Present-day costs range from 28s. to 42s. per ton.

The commission recommends that the new company, which it suggests should be formed to operate the western end of the field, would require to spend approximately £150,000 on capital improvements, apart from money required for exploration and development work underground. Co-operation between management and employees must be developed and maintained, says the report, if the scheme is to succeed; and special inducements must be put forward to induce investors to furnish the necessary capital. The report concludes with the following summary:

"1. If the life of the field is to be considerably prolonged, a thorough reorganization of existing methods is an immediate necessity.

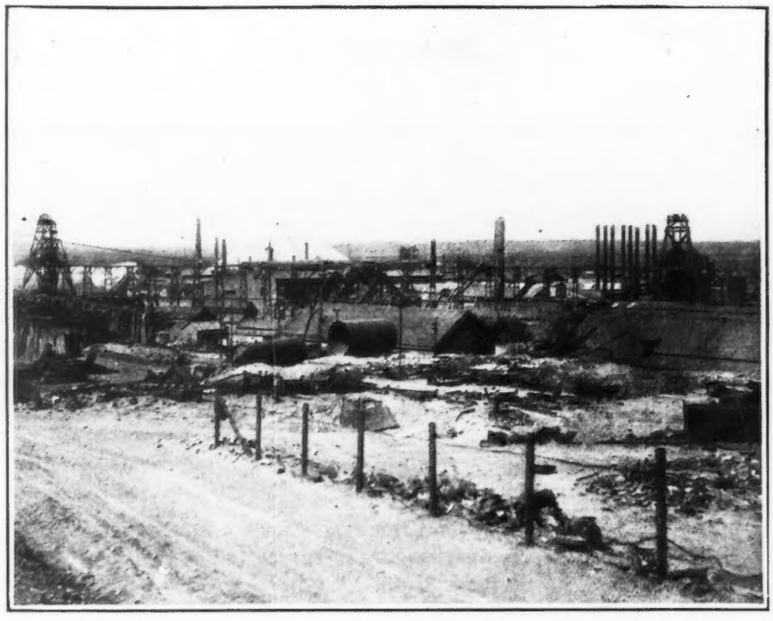
2. Notwithstanding the neglect of large-scale development for a number of years, the expenditure of money, even at this late period, for the purpose of ascertaining whether further substantial ore resources are available is justifiable.

3. Amalgamation of the mines at the western end of the field should be immediately effected in the hope that the mines at the eastern end will co-operate in the near future.

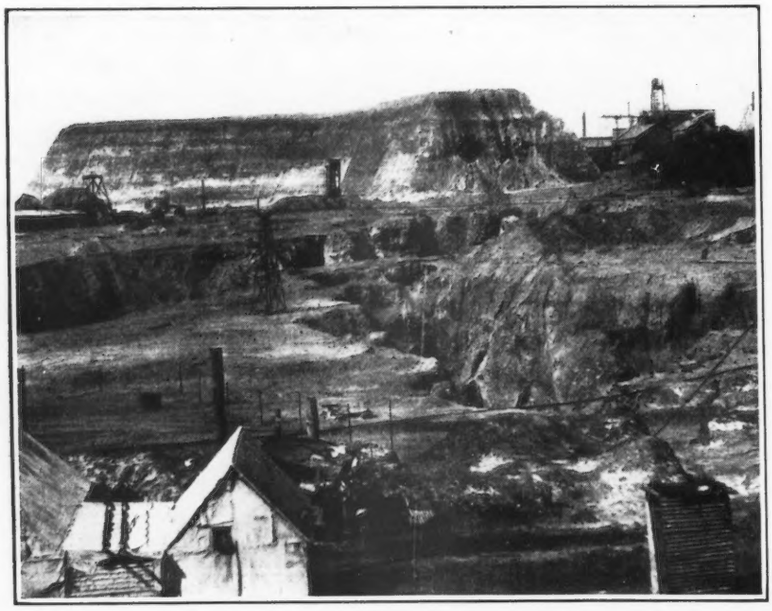
4. Following upon this amalgamation new money will be required for two purposes: First, to carry on immediately essential improvements both underground and on the surface to enable the extended Lake View and Star Mill to treat 25,000 tons of ore monthly at a profit. Based upon known ore reserves this scale of operations, it is estimated, can continue for a period of three to five years. Second, for the purpose of instituting an intensive campaign of geological survey and ore exploration and development to determine what additional ore reserves will be available and to that extent what further capital expenditure will be later justified in order to further reduce working costs and possibly increase output.

5. The commission, therefore, recommends that the amalgamated company should consider the question of raising money by the issue of shares to which special conditions will apply.

6. The determination of the co-operative action which might be recommended for the consideration of the commonwealth and state governments will depend to a great extent on the measures taken by the mining companies and employees for the internal reorganization of the industry, and the support which is given to their efforts by mining investors in Australia and elsewhere."



View southwest from Associated mine, in Kalgoorlie district. Boulder Perseverance property at right



A tailing dump in the Kalgoorlie district—the result of many years of operation

Comanche Extends Holdings

By the purchase of the Boraska group of claims, on Blind Springs Hill, Mono County, Calif., the Comanche Mining & Reduction Co. has extended its holdings so as now to include 36 patented and 11 unpatented claims. The Boraska claims cover extensions of veins in the Comanche holdings. A crosscut tunnel about 3,500 ft. in length is being extended with the Comanche vein as its objective, some 2,900 ft. further.

New Gold Dredge on Trinity

A new gold dredge is being constructed upon the Trinity River a short distance above Junction City, Calif., by the Madrona Dredging Co. E. L. Smith is superintendent. The dredge is to cost about $150,000 and will be constructed in part of salvage material. Buckets are 9 cu.ft. in size.

Treadwell Yukon Issues Annual Report on Errington Mines

Results Justify Campaign of Rapid Development Work Now Under Way—Pilot Mill to Be Erected, Following Laboratory Tests

THE FOLLOWING EXCERPT is taken from the annual report of the Treadwell Yukon Co. for the year 1926 and gives details about the Errington group now being explored by the Treadwell Yukon Co., Ltd. This company is owned by the Bunker Hill & Sullivan (50 per cent), Alaska Treadwell (30 per cent), Alaska Mexican, and Alaska United (10 per cent each).

The Errington properties, which have aroused wide interest, are stiuated in Ontario, Canada, about seventeen miles west of Sudbury and two miles south of the main line of the Canadian Pacific.

Options—The first options were secured in July, 1925, under terms that made it necessary to secure preliminary information as soon as possible. Because of this fact, by reason of the large area to be prospected, and because the outcrop is to a large extent concealed by an overburden of lake deposit, diamond drilling was begun at once and continued for a year. The result of such drilling fully justified making the option payments as they fell due on most of the ground originally held, guided the securing of additional options from time to time, and determined the dropping of options where the area involved was found not to cover the ore zone either on its dip or strike.

The area finally selected covers the strike of the ore zone for 25,000 ft., protects the vein to a depth of 5,000 ft., measuring down the dip, and contains about 6,000 acres. To this date a total of $475,825 has been paid on the installment payments due under the option agreements, and the purchase of 1,760 acres has been completed; the installment payments required to complete the purchase of the remaining acreage total $152,600. In addition to the purchased and optioned areas, the company owns eleven mining claims, containing 453 acres.

Diamond Drilling — The diamond drilling work was too widespread to permit precise interpretations of the logs of the holes drilled, and consequently no calculations of blocked-out tonnage can be based on the cores of ore found. Eighty-five holes were drilled, making a total of 48,806 ft. of drilling, which indicated the ore found to have an average thickness of 23 ft., with an average assay content of 3.18 oz. silver, 1.35 per cent lead, 2.66 per cent copper, 6.03 per cent zinc, 0.048 oz. gold, or a gross assay value of $18.30 per ton, figured at 4c. per lb. for lead, 6c. per lb. for zinc, 14c. per lb. for copper, and 50c. per oz. for silver.

Underground Development Work—As a better knowledge of underground conditions could be obtained by underground work, No. 1 shaft was started in July, 1926, and was sunk to a depth of 300 ft. From the bottom of the shaft, a main crosscut was driven to the assumed footwall and drifts were started east and west, the east drift at this date (May 10, 1927) having been advanced 500 ft. and the west drift 300 ft. At a distance of 210 ft. from the shaft, the main crosscut struck the first ore, which proved to be 20 ft. wide with an assay content of 2.24 oz. silver, 1.78 per cent lead, 0.86 per cent copper, 9.07 per cent zinc, and a trace of gold, or a gross assay value of $15.82.

Crosscuts from the east and west drifts are being driven at intervals of 100 ft. At 100 ft. east, a south crosscut found 9 ft. of ore assaying 2.31 oz. silver, 0.62 per cent lead, 0.93 per cent copper, 5.72 per cent zinc, and .028 oz. gold, or a gross assay value of $11.68—a north crosscut at this point has not yet been started. At 200 ft. east, a south crosscut intersected 8 ft. of ore, assaying 3.70 oz. silver, 5.40 per cent lead, 2.40 per cent copper, 7.70 per cent zinc, or a gross assay value of $22.13—the north crosscut at this point so far encountering but low-grade vein matter. At 300 ft. east, the north crosscut shows 7.6 ft. of ore, assaying 3.12 oz. silver, 3.05 per cent lead, 1.71 per cent copper, 15.81 per cent zinc, or a gross assay value of $27.75—the south crosscut from this point so far showing only low-grade vein filling. Crosscutting is now being done to the north and south from points 400 ft. and 500 ft. east. In the west drift, short crosscuts have been started at 100 ft., 200 ft., and 300 ft., but have not yet found ore. In calculating all above mentioned assay results, the following metal prices were used: Silver 50c. per ounce; lead, 4c. per pound; zinc, 6c. per pound; copper, 14c. per pound; gold, $20 per ounce—these prices for lead, zinc and copper being approximately an average of the London prices for the last thirty-two years, computed at average yearly New York rate for sterling exchange.

The amount of underground work done to date is small, and particularly so in view of the very large area to be explored. Ore has been found to occur anywhere within a width of 1,000 ft. measuring across the strike, and there are indications that between the extreme footwall and the extreme hanging wall the distance may be 2,000 ft. These figures represent the width of the ore zone, and we have yet to learn the habit of the occurrence of oreshoots across this width. At this time it is not possible to determine satisfactorily the relation between the ore found by the underground work and that found by the diamond drilling, and, judging by present appearances, the ore cut on the 300 level by the several crosscuts is different from, and lies to the north of, that cut in the vicinity by diamond-drill holes. However, even in the absence of definite knowledge of the relationship of the various ore exposures, the general appearance is promising for a large tonnage and justifies the present plans for a campaign of more rapid development work.

Metallurgical Testing Work — From the time of taking the first options, this work has proceeded continuously at the Bunker Hill & Sullivan metallurgical plants, Kellogg, Idaho, on surface samples and on the diamond-drill cores, as fast as they were secured, and it is now being energetically pushed on a carload of ore sent to Kellogg from the main crosscut. The laboratory and other testing work done on this ore at Kellogg will be followed up by larger-scale work in a pilot mill to be erected on the ground, plans for this mill now being well under way.

A Joplin-Miami District Mine Again Awarded Safety Trophy

Bronze "Sentinels of Safety" Won by Muncie Mine of the Federal Mining & Smelting Co.

For the second year in succession a mine in the Joplin-Miami district has been awarded the bronze trophy, "Sentinels of Safety," for having the lowest accident record of all metal mines in the United States: The award for 1926 was made to the Muncie mine of the Federal Mining & Smelting Co., situated near Picher, Okla. The trophy last year was won by the Liza Jane mine of the Cortez-King Brand Mines Corporation, also situated near Picher. In winning the trophy for 1926 the Muncie mine established what is believed to be a world's record. It has not had a lost-time accident in almost two years of operation, the term "lost-time accident" meaning an accident that has kept a worker away more than one day from his work. The property has a total of more than 40,000 consecutive man-shifts without such an accident. P. W. George, general manager of the Federal company's mines in the district, has received a letter of congratulation from Herbert Hoover on the showing made by the Muncie, and besides receiving the trophy each worker at the mine will receive a certificate of honor from the U. S. Bureau of Mines. The trophy is one of three offered by the *Explosives Engineer*, the other two being for coal mines and for rock quarries.

James Roper, of Sarcoxie, Mo., has recently reported a strike of zinc ore in drill holes at a depth of about 240 ft. on his farm, which is about twenty miles east of Joplin, Mo. The find is considered of particular interest because it is at a depth which is deeper than any mining operations of the past in the Sarcoxie section. Good ore production was recorded in the section for a number of years.

Promising strikes also have been reported recently on what is known as the Dallas lease, south of Granby, Mo. H. T. Moss and associates, of Kansas City, have been carrying on drill prospect work in this vicinity and plan to develop the lease thoroughly. A mill will probably be erected soon provided ore prices justify proceeding with operations. Several good drill holes also have been reported on the Adams lease, in the same neighborhood, the drilling in this case being done by Harry Payne Whitney, of New York.

The Joplin-Miami field is experiencing an unusually quiet summer, as a result of low prices for zinc and lead ore, but increased activity is expected early in the fall.

Alaskan Reports Show Large Increase in Operations

Airplane Company Receives Subsidy to Operate Line Between Anchorage and Nome

The Anchorage Airplane Co. has arranged for a territorial subsidy of $5,000 to transport passengers and mails between Anchorage and Nome at a rate of 30c. per mile per passenger for the through trip and $1 a mile for intermediate stages, not exceeding the through fare. The rate on express is one-seventh of a cent per pound.

A new company, incorporated as Alaskan Explorations, has been organized by J. V. Rittenhouse, of San Francisco, formerly of New York, to acquire and develop mineral properties in Alaska. The company is capitalized at $500,000.

Riverside mine, at Hyden, has made a shipment of 102 tons of concentrates to Selby smelter. This is the largest shipment in the history of the mine. The Kassan Gold Co., operating on Prince of Wales Island, has sent out its first gold brick. The company is employing fourteen miners. Fifty per cent of the values is extracted by amalgamation and the remainder of the recovery is by flotation.

The Rasoon Gold Mining Co. is operating a mine at Hollis, on Prince of Wales Island, 20 miles from Ketchikan.

Anchorage people have been obtaining options on placer ground in the Hope district with a view to testing it for dredging.

The Lucky Strike Syndicate held a meeting at Cordova at which it was reported a vein 28 ft. in width had been developed by tunnel for a length of 230 ft. There are two other veins, one 24 ft. wide and the other varying in width from 16 to 29 ft. A contract is to be let for new tunneling to the extent of 250 to 300 ft.

Members of the senior mining class at the Alaska College at Fairbanks have been examining the copper mine at Latouche, the coal mines at Matanuska, and the gold-quartz mines of Willow Creek under the direction of Dean E. N. Patty, professor of geology and mineralogy.

T. J. Deveney has brought into Valdez rich specimens of gold quartz from a prospect he is developing on Mineral Creek, west of Valdez.

The Ethel Mining Co. has crosscut the Ruby vein a distance of 115 ft., and is drifting south toward the dip of the rich ore-shoot formerly mined from the Erickson shaft. The vein is 5 ft. wide and much leached, but shows free gold associated with iron sulphides. The gangue contains considerable talc.

The Thunder Creek Mining Co.'s property is advertised for sale at Valdez by the U. S. marshal at the instance of the Bremerton Trust & Savings Bank.

The Kennecott mine made the record of complete freedom from accident for the month of April, the result of enforcement of approved safety methods and education of employees in the application thereof. This is the more remarkable in that the miners have to be transported 4,000 ft. daily by aërial tramway between the camp and the mine workings at the summit of the mountain. In 1926 the Kennecott company conducted its operations at the Kennecott mines and Latouche without a fatality.

A British company, headed by N. W. Whitworth, of Manchester, England, has arranged to drill the Mother Lode at Mile 43½, on the Alaska Railway, under the option entered into with the owners last fall.

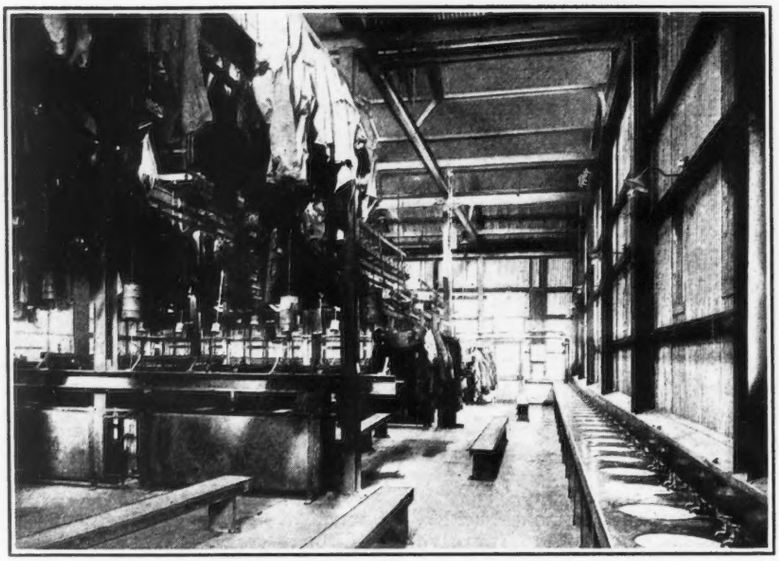
Willow Creek expects an active season in its gold-quartz mining. The Marion-Twin Gold Mining Co. will operate the Craigie Creek mines. The Fern Gold Bullion, War Baby, Lucky Shot, and others will be working.

The Kennecott Copper Co. has arranged for examination this summer of the Millet and Dutton copper groups in the Iliamna district; considerable development has been done on these holdings.

The Whitworth Syndicate, of Manchester, England, is arranging to put a dredge on Engineer Creek at Fairbanks.

The Elmes Gold Mining Co. is developing the Happy gold-quartz mine.

The Detroit Gold Mining Co. has arranged to prospect Smith Dome, supposed to be the source of the gold of the Koyukuk placers. If results are favorable, a hydraulic plant will be installed.



Change house at the Broken Hill South mine, Broken Hill, Australia

A sill floor stope in the Broken Hill South mine, Broken Hill, Australia

Broken Hill South to Resume Shaft-Sinking Operations

Announcement has been made that during the current year Broken Hill South, Ltd., will resume sinking the new main shaft which was begun in 1925 on its property at Broken Hill, New South Wales, Australia. The size of the shaft will be increased, two compartments being added to the four originally planned. Two of the compartments will be used for ore skips, two for cages, and one each for pipes and cables. Work on the shaft was discontinued during the absence of H. H. Carroll, underground superintendent of the company, who has been on an inspection trip to the mining districts of the United States.

Many New Developments in the Arizona Mining Districts

Shattuck Denn Lead Concentrator at Bisbee Is Closed Down for an Indefinite Period

Closing of the Shattuck Denn lead concentrator at Bisbee for an indefinite length of time on July 1 has been announced by T. O. McGrath, general manager of the corporation. The Shattuck mine at present is producing 200 tons of ore per day. During July the high-grade portion of this tonnage will be shipped to the El Paso smelter. After July the ore will be treated either at the Copper Queen concentrator in Warren, or at the lead smelter in Douglas. The marked reduction in the price of lead was given as the reason for closing down the concentrator. Since production is to be reduced the ore can be handled more economically by shipment to a custom plant than by maintaining the concentrator in operation. The Shattuck Denn concentrator has a capacity of between 300 and 500 tons daily. The mill began operating in August, 1918, and was closed down in December, 1920. It was reopened in April, 1922, and has been operating continuously since that time. The closing of the mill will throw approximately fifty men out of work.

Sinking operations at the Denn shaft have reached a depth of 1,950 ft. The last 200 ft. of the shaft are in the fault zone, so soft that it has been necessary to crib solidly with 10x12 in. timber. At 1,950 ft. a hard rib has been encountered which is believed to be the footwall of the fault zone. If the ground is hard enough a station will be cut at a depth of 2,000 ft.

The first signs of water to be encountered in the sinking of the Phelps Dodge Corporation's new three-compartment shaft in Warren appeared recently, when a small quantity oozed in from the ground at the 1,026 ft. level. A temporary pumping installation is being made to take care of the situation until the 1,800-ft. depth is reached, when pumping equipment at the C. & C. shaft, a half mile distant, will handle the water flow by means of a long drift that is now being cut between the two shafts.

The first shipment of material and equipment for the construction of a new hoist that is to be erected at the Cole shaft of the Calumet & Arizona Mining Co. for use in its extensive development campaign has just been received. The hoist was manufactured by the Allis-Chalmers Co. It has a 2,200 ft. lift and will be operated by a 100 hp. motor. The Cole shaft in past years produced considerable ore. A new find has also been reported in the vicinity of the Junction shaft, but sufficient work has not as yet been done to afford any estimation of its size.

A small flotation mill is to be erected at the old Gunsight mine, near Ajo, according to Sam Fields, of Phoenix, who is in charge of the property. The mine was a big producer of silver-lead ores in the early days, until the demonetization of silver in 1892. Since then the property has been in the hands of leasers, who left it in bad condition. Mr. Fields took charge for the owners a year ago, and has been cleaning up the mine and has developed enough ore to warrant building a small mill. With the new lead smelter at Bisbee starting up, the time seems propitious for putting the Gunsight mine on a producing basis. In addition to the flotation mill, an electric power plant is to be built to serve the mill, hoist, and compressor. Mr. Fields was formerly superintendent of the Ray-Hercules company, and was in charge of building the smelter at Needles in 1906. Walter S. Wheeler, of Detroit, is owner of the Gunsight property.

The 2,300 ft. tunnel on the Oro Golconda property, northwest of Kingman, is being driven at the rate of thirteen feet every twenty-four hours. The tunnel is 5 ft. by 7 ft. in cross section. Work is proceeding under the supervision of A. S. Pearce.

The water level at the Gold Ore Mining Co.'s property, at Goldroad, has been reduced to the 500 level, according to a recent report. Unwatering is expected to take some time, but as soon as it is completed operations will be started.

Purchase of the Puntenney Lime Co.'s quarry and plant on the Ash Fork Highway, north of Prescott, by Stone & Webster Co., of New York and Boston, is reported.

News From Washington

By PAUL WOOTON
Special Correspondent

Six Potash Minerals in Drill Core

Guard of Marines to Be Sent to San Albino Property, in Nicaragua—Railroad Freight Tonnage of Mine Products Increases 15 Per Cent

SIX POTASH MINERALS have been identified in the core taken from the second hole drilled by the U. S. Bureau of Mines on public lands in New Mexico in the course of its exploratory work. These minerals were found in the preliminary examination of the core, which is in process of complete analysis. The work is being done by the Geological Survey.

Drilling has begun on the third hole. This well is being put down on one of the sites prepared by the Geological Survey in Texas. Leases now have been signed by all land-holders within the prescribed area surrounding two of the Texas sites.

On the third hole the salt occurs at a depth of 500 ft. No core will be taken until the salt is reached, but from that point the salt will be cored for a depth of 1,000 ft. At the fourth hole the salt lies at a depth of 1,100 ft. Drilling will continue for 700 ft. in the salt.

F. L. Hess, mining engineer, on the staff of the Bureau of Mines, is in the West on a two months' field trip, during which he will acquaint himself with current operation at mines producing the rarer metals. J. W. Furness, of the technical staff of the Bureau, is visiting manganese, mercury, and chrome properties. C. E. Julihn, the Bureau copper specialist, is delivering a series of Chautauqua lectures on mineral industries.

Bandits have taken possession of the San Albino mines, in the State of Neuva Segovia, in Nicaragua. Reports to the State Department tell of a raid on the property by a band of fifty led by a former employee named Sandino. On the first visit 500 lb. of dynamite, with supplies of caps and fuse, were carried away. Later the bandits returned and took possession. All foreigners residing at the mine were driven away. Efforts are being made by the bandits to operate the plant. Charles Butters, the owner of the property, which is valued at $700,000, appealed for help to the American legation and the force of marines there. A report states that a guard would be sent to the property.

A movement is on foot looking to the reconsideration of the order of the Interstate Commerce Commission which requires payment of freight bills within forty-eight hours. Ten days should be allowed, it is contended, to give time for the checking of the bill and putting through the account. This would coincide with the usual commercial practice of allowing ten days for these purposes. If bills are paid immediately, all errors have to be adjusted through claims channels, which ties up the money of consignees from thirty to sixty days and substitutes a complicated and expensive process for a simple transaction.

A 15 per cent increase in the tonnage of mine products was the brightest spot in the railroad statistics for the first quarter of the year. During that quarter mines contributed 165,897,128 tons to the revenue freight of the Class 1 railroads. This compares with 144,777,582 tons in the quarter ended March 31, 1926.

On the other hand, there was a decrease of 6 per cent in the tonnage offered by the forest products industries; a decrease of 4.33 per cent in less-than-carload freight, and small decreases in the tonnage offered by manufacturing plants and by those engaged in stock raising and the manufacture of animal products. The only other commodity group which showed an increase in the amount of freight originated was agriculture. The increase in shipments of products of agriculture was 4.45 per cent.

The total tonnage handled by the railroads during the first quarter of 1927 was 299,915,665 tons. In round numbers, 55 per cent of all freight was contributed by the mining industry. The figures are those of the Interstate Commerce Commission.

Melbourne Letter

By Peter G. Tait

Special Correspondent

Preliminary Report Is Submitted on Investigations Made at Mount Morgan

Melbourne, May 31—The preliminary report of E. E. Barker, who visited Australia to advise the directors of the Mount Morgan Gold Mining Co. as to the possibilities of applying the open-cut method for the extraction of ore, has been received. Mr. Barker completed his investigations in January, but decided to return to America to confer with L. S. Cates, of the Utah Copper Co., and W. S. Boyd, of the Nevada Consolidated Copper Co., before completing his report. The full report is not yet available, but the directors announce that the considered opinion of all three is that the open-cut method of mining the Mount Morgan orebody cannot be applied profitably. The directors have arrived at the conclusion that no other method of carrying on operations at the mine can be recommended with reasonable prospect of success. Therefore it would appear that operations must soon cease. The last official estimate of ore reserves by A. A. Boyd, general manager, dated May 31, 1925, was 2,701,450 tons of an average value of 2.61 per cent copper and 5.99 dwt. gold per ton. In the report for the following year it was explained that if the proposed open-cut method were practicable it should increase the tonnage to approximately 8,000,000 tons, but of a lower grade.

Mr. Barker's covering letter, dated March 31, from Salt Lake City, Utah, reads as follows:

"I respectfully submit herewith the report which covers my findings at Mount Morgan from Jan. 1 to Jan. 27, 1927, inclusive. The problem presented was to determine whether or not open-cut shovel operations were suited to the conditions at Mount Morgan, and whether or not the available ore would warrant the capital required and contain sufficient value to bear the costs of electric-shovel operations.

"I regret to state that the ore obtainable for shovel operations, after deducting that portion which cannot be recovered, is too small in amount and too low grade in value, in my opinion, to warrant the undertaking. Of the 8,000,000 tons of known ore, only 5,900,000, or 74 per cent of the whole, could be reclaimed. It is unfortunate, but the best grade of material falls in that section of the mine capped with the greatest amount of overburden. In shovel work of the nature that would be met with at Mount Morgan the grade of the ore as heretofore mined could not be maintained. This is due to the fact that a shovel cannot make careful selection. The ore becomes mixed with the filling in the blasting and loading operations, and the result is an increase in quantity, but a decrease in metal content; so that the ore remaining, after first setting aside the richer non-recoverable part, must be further reduced in value as a result of this dilution. I have used as a dilution factor 12½ per cent, which I am certain is the best that could be expected. With these changes and with the estimates as used herein, there results a net operation loss of 1s. 8.649d. per ton apart from plant redemption.

"The complete details and answers to the questions in your letter to me of Dec. 28, 1926, will be found herein. The serious points of difference between the former calculations and my own are, in the order of their importance, as follows: (1). It was found that the west end of the mine, taken by itself, would not bear the expense of removing its own overburden. It would therefore be a mistake to excavate it. (2). The slopes used before were 52 deg. from the horizontal. This degree, in my opinion, would not be maintained for any considerable depth, as it would be too dangerous to workmen and expensive equipment under it. I have taken 45 deg. as the maximum, and this even is doubtful. The calculations, of course, on this basis increased the amount of waste to be excavated. (3). The matter of dilution already discussed. (4). The 10 per cent discount factors deducted from ore and added to waste. This report and its conclusions, as you instructed, take no cognizance of value in the overburden. If any considerable amount assaying three pennyweights or over can be definitely determined, this could be milled at a profit, or at least without loss. The ratio of waste to ore would then be reduced, as ore added to the reserves would be deductible from the waste to be removed."

Belmont Copper Buys Interests in Superior District

Announcement has been made by officials of the Belmont Copper Mining Co. that they have completed arrangements for taking over fractional interests held by the Calumet & Arizona Mining Co. in three patented mining claims near Superior, Ariz., for $150,000. A fund of $450,000 is being provided by those interested in the deal, and of this sum, $150,000 will be paid out as purchase money and the remainder spent for development and other corporate purposes in accordance with the decisions of the company's officials.

About six months ago the Belmont closed a $200,000 option on a group of forty claims owned by the Consolidated Holding & Trust Co., and by the transaction just closed will become owner of a complete chain of 120 claims, covering approximately 2,400 acres. Title to the last three claims was acquired by Calumet & Arizona in 1912, when it took an option on the entire group now owned by Belmont. Some work was done, but no veins were cut, and on the outbreak of the World War, Calumet & Arizona surrendered the option on all but the fractional interests which it is about to sell.

The Belmont shaft is down 1,650 ft., and it is planned to open up the property at various levels and begin regular shipments to the Magma smelter, at Superior, which is only about five miles from the property.

Johannesburg Letter

By John Watson

Special Correspondent

H. G. Latilla Is Interviewed on Visit to Rhodesia—Chrome Mining to Develop

Johannesburg, May 31.—H. G. Latilla, chairman of the Rhodesian Exploration Co., was interviewed in Johannesburg, on May 23, by a representative of *The Star*. Mr. Latilla has just returned from Rhodesia, where he has been inspecting properties. He has interests in Peake's Chrome Mines and thinks that the chrome mining industry is likely to develop very considerably, as chromite is used extensively for hardening iron and for producing rustless steel and iron. He is also a director of Goldfields Rhodesia Development Co., and had visited the Wanderer mine (Selukwe), over which the company holds an option. In testing this mine £40,000 had been spent without notable or definite encouragement; but there was reasonable hope that, with the extension of activities, there would be more favorable results. The copper industry in Rhodesia was being largely developed by the Southern Rhodesia Base Metals Co., and should be successful. The mineral wealth of the country had not yet been even scraped. Mr. Latilla is also interested in Marais Drift, on the East Rand, and said negotiations to sink bore holes were in progress. This property adjoins Sub Nigel.

For the first four months of this year the gold production of the Transvaal is valued at £13,869,822, working costs totaled £9,559,419, and estimated working profit was £4,310,403. Working costs for the four months average 19s. 7d. and working profit 8s. 10d per ton.

South African Township's quarterly report referring to Eerstegeluk Platinum Mines states that development operations on Klipfontein and Kroondal, in the Rustenburg district, continue to give satisfactory results. Mine incline shafts are being sunk, the main incline on Kroondal having reached a depth of 656 ft. On the three properties, the development footage totals 4,620 ft.; 4,106 ft. was sampled and the reduced values average 5.3 dwt. over 36 in. The deposit is very regular, both as regards width and values. Cabled advices from Fried Krupp, Grüsonwerk, Germany, indicate favorable preliminary extraction results on bulk samples of ore sent to that country for testing purposes, some months ago.

A second extraordinary meeting of Government G. M. Areas, Ltd., was held in Johannesburg on May 23 to receive the report of the first meeting, which unanimously approved the proposal to split the existing £1 shares of the company into four 5s. shares. The decision was again ratified, unanimously, and the subdivision will take effect from July 1.

Russo-Asiatic Issues Report on Its Lead-Zinc Properties

Holds Majority Interest in the Mines de St. Sebastien-d'Aigrefeuille

A recent report issued by the Russo-Asiatic Consolidated, Ltd., on the Villemagne orebody of the Compagnie Nouvelle des Mines de Villemagne states that diamond drilling and underground work on a section of the Villemagne orebody, some 1,600 meters in length, indicate 3,000,000 tons of ore in this area, with an average of 12½ per cent combined tenor of lead and zinc and 3 oz. silver. No work has yet been undertaken outside this area. Ancient workings continue to the east for a distance of 1,100 meters, and at the western end also the continuation of the vein is traceable, there being an imposing vein exposure 2,800 meters to the west of the present workings.

The mill has been increased to a capacity of 240 tons of ore daily, and a further increase has been put in hand to bring the milling capacity up to 550 tons daily by the end of the year. At this latter rate of treatment, annual operating profits, at exchange of 125 francs to the pound sterling, are estimated as follows:

16,200,000 francs with lead £24 and zinc £27
18,400,000 francs with lead £25 and zinc £28
22,400,000 francs with lead £28 and zinc £32
26,350,000 francs with lead £31 and zinc £35

As regards the Mines de St. Sebastien-d'Aigrefeuille the report states the ore deposit is in the form of a flat bed lying at or near the surface, and extending some 5 kilometers in length, and 300 to 400 meters in width, the thickness of the mineralization varying from two to more than five meters. At the eastern end, easy of access and where old workings existed, a small area is being tested by pits sunk at regular intervals. This work is not yet completed, but the pits sunk to date have developed, ready for mining, 1,500,000 tons of ore averaging 4 per cent lead, 1½ per cent zinc, 2½ oz. silver, and also a valuable amount of pyrite. Operations confirm that the cost of mining should not exceed 2s. 6d. per ton. Tests indicate no difficulties in treating the ore, which, assuming the above-mentioned low grade, is estimated to return the following profit per ton:

With lead price £24 10s. 0d., profit 8s. 0d. per ton
With lead price £27 0s. 0d., profit 10s. 4d. per ton
With lead price £29 0s. 0d., profit 11s. 5d. per ton
With lead price £31 0s. 0d., profit 12s. 6d. per ton

To demonstrate this on a commercial scale, a plant to treat 120 tons daily is now being erected. By selective mining a smaller tonnage of ore, of approximately double the above gross value, is available.

The Russo-Asiatic company holds 162,736 shares of an issued capital of 280,000 shares of the Compagnie Nouvelles des Mines de Villemagne and has negotiations pending for the acquisition of a further 25,000 shares. It also holds a majority interest in the Mines de St. Sebastien-d'Aigrefeuille with an option to acquire certain other shares which if exercised would give it a total interest of 70 per cent.

London Letter

By W. A. Doman
Special Correspondent

Lead Producers in India, Mexico, and Australia Suffer from Low Market Prices

London, June 21—Considerable disappointment was experienced by shareholders in Burma Corporation at the reduction in the final dividend by one anna (about 2¼c.) per share, making the payment six annas against seven for the preceding dividend period, and, for the whole year, 12 in place of 13, tax free. Every one had hoped for more, but the serious fall in the prices of lead and zinc altered the position. The lower return has made little difference to the price of the shares, as the mine has been taken out of the speculative category. It is only a question of waiting for a recovery in metal prices. The Burma Corporation is not the only company that is suffering in this way, there being the Broken Hill (Australia) mines and the San Francisco Mines of Mexico. These are all good investments, and well managed, but until this country's business improves again and consumption increases, there is little hope of an upward movement in the price of the shares.

It is reported that the reason V. F. Stanley Low is returning from Panama to see the directors of the Panama Corporation is that one portion of the property is giving such encouraging results that the time has arrived to consider its flotation as a separate undertaking. This proposition will in all probability be sympathetically received, as it should have something to show, and will not be a mere prospect.

It is understood that an important South African financial group will soon bring to the notice of the public a talc property in South Africa.

Seneca Mine Shut Down

The shutdown of the Seneca mine, in the Michigan copper district, on June 30, for financial reasons, came at a time when the mine was entering upon better days so far as the physical condition of the property was concerned. The period of major construction and consequent heavy outlay was at an end, and the property was steadily increasing production. Recently, 1,900 tons of copper rock were hoisted in one day. This was the largest daily tonnage in the history of the company's operations. The average has been between 1,600 and 1,700 tons. The 8 and 9 levels in No. 1 shaft were opening up well, both north and south, and good ground was also being developed in openings north of both Nos. 2 and 3 shafts. Several hundred men were employed by Seneca, the majority of whom will most probably be employed by other mines. Seneca had built up an efficient working force in all departments. It is believed the shutdown will be only temporary, pending a readjustment of affairs, and that meanwhile the mine will be kept in good condition.

California's Gold Production Decreases 9 Per Cent

Value of Lead and Zinc Increases—Silver Slumps 40 Per Cent—Copper 30 Per Cent

The value of gold, silver, copper, lead, and zinc produced at mines in California in 1926 was $20,050,801, a decrease of $3,233,553, or 14 per cent, compared with the value of these metals produced in 1925, according to statistics compiled by the U. S. Bureau of Mines. There were decreased yields of 9 per cent in gold, 40 per cent in the value of silver, and 30 per cent in the value of copper, but increases of 13 per cent in the value of lead and 76 per cent in the value of zinc produced, compared with the values of these metals in 1925. There were 818 mines producing in 1926, of which 483 were placers and 335 were lode mines, compared with 359 placers and 332 lode mines in 1925.

Production of gold in 1926 was 576,798.40 oz., of which 252,923.99 oz. came from placer mines and 323,874.41 oz. from lode mines. Dredges produced about $200,000 more gold than in 1925 and 95 per cent of the total value of the output from placer mines in 1926.

Silver produced in 1926 was 2,022,460 oz., valued at $1,262,015, which is $1,031,956 oz. less in quantity and $857,750 less in value than in 1925. This large decrease in yield of silver is due largely to the cessation of activities in September at the California Rand Silver property, in San Bernardino County, though some exploratory work at that mine was carried on throughout the year. The silver produced from copper and lead ores was less than in 1925.

Production of copper in 1926 was 33,466,299 lb., 13,398,614 lb. less than in 1925. The copper mines in Shasta County were closed, which reduced the copper output of the state materially. Plumas County copper mines also reduced their yield of copper, but copper mines in Calaveras County increased their yield.

The lead output in California in 1926 was 8,093,513 lb., 1,527,313 lb. more than in 1925. Mines in Inyo and Los Angeles counties contributed largely to the lead output of the state.

Zinc produced by California mines in 1926 amounted to 20,433,887 lb., valued at $1,532,542, which is larger than the output in 1925 by 8,944,650 lb. in quantity and $659,360 in value. Mines in Los Angeles and Shasta counties increased their zinc yield, and zinc concentrates from these mines were exported to Belgium.

North Butte Stockholders to Investigate Receivership

On June 17, following the announcement that the North Butte Mining Co. had been thrown into receivership, about 200 stockholders of the company, residing in Butte, held a meeting and voted to appoint a protective committee to investigate proceedings which have plunged the company into receivership. It was voted that Charles R. Leonard, chairman of the meeting, head and and appoint the committee.

Societies, Addresses, and Reports

International Chamber of Commerce Indorses Geneva Resolutions

Delegates Told They Have a Moral Responsibility to Work in Their Respective Countries for Enactment of Necessary Legislation to Make Economic Conference Conclusions Operative

By Edward J. Mehren
Vice-President, McGraw-Hill Publishing Co., Inc.

Stockholm, July 1.

CONSIDERING trade barriers the chief obstacle to European economic recovery, the International Chamber of Commerce has devoted its major attention to methods of their removal. Taking as a text the conclusions of the economic conference at Geneva, which, in turn, were based on an exhaustive study of the Chamber's Trade Barrier Committee, it unanimously and enthusiastically indorsed the Geneva conclusions.

The delegates were told in emphatic speeches by Sir Arthur Salter, head of the economic section of the League of Nations, and by leaders of the various delegations, that they had a moral responsibility to work in their countries for the enactment of necessary legislation to make the Geneva conclusions operative; that trade barriers are strangling the nations economically; that millions are suffering; and that a reduced standard of living is general as a result. The need for quick action was emphasized; otherwise, conditions may grow worse.

Other important conclusions for facilitating international trade and commercial relations relate to transport, uniform regulations regarding checks and bills of exchange, and export credit. In a report, trade barriers in an international sense were defined as "those arbitrary national restraints on free movement of goods, capital, and services which not only restrain trade and traders but limit the economical production and distribution of goods, capital, and services, to the detriment of the peoples affected by the restraint. In production there is a unit of maximum economy: in distribution there is a market of maximum economy. Any barrier which prevents the coordination of these two is a trade barrier in the sense used by the Chamber."

The Chamber pledged itself to cooperate with the League of Nations in carrying out the Geneva conclusions and asked its national committees to urge their governments to accept the conclusions and take appropriate action (the conclusions have already been indorsed by Belgium, Austria, Germany, Czechoslovakia, Holland, and Sweden, with expressed willingness to take necessary legislative steps). It indorsed (1) the Geneva declaration that tariff walls and policies which directly or indirectly hamper trade should be reduced or removed; (2) expressed satisfaction that the League will call a diplomatic conference to draft conventions giving equality of treatment to foreigners admitted into any country and defining the conditions for exercising trade and the taxation of foreigners; (3) advocated the abolition of passport visas; and (4) urged the nations which have not done so to ratify the navigable waterways and maritime port conventions concluded at Barcelona and Geneva, so that transportation barriers could be removed.

The Chamber also indorsed the abolition of prohibitions on exports and imports and a lowering of the tariff where it is unduly hampering, a simplification of tariffs, and the unification of customs nomenclature; long-term treaties to prevent tariff fluctuations; the abolition of exaggerated consular fees and unjustifiable health measures; the removal of prohibitions on and artificial hindrances of free international movement of capital; and, finally, it indorsed the Geneva conclusions on rationalization and international industrial pools.

Commenting on conclusions regarding trade barriers, Salter commended the co-operation of the League and Chamber. The latter, being a private body, has freedom of action, and the League looks to the Chamber for much of its driving force. He emphasized the point that the Chamber must be in advance of the League with its proposals. He characterized the conclusions as a declaration not of free trade but for freer trade, and said that barriers that seemed the exercise of individual wisdom had proved collective insanity and that there had now been drawn up at Geneva a decalogue of collective wisdom. Salter expressed the belief that the progress of the Geneva conclusions thus far through public declarations of the governments, through indorsement of the Chamber, and through plans for diplomatic conference warranted the hope that, if the national committees of the Chamber will use their influence, their governments' action will result in relief for the suffering and misery of millions in Europe today. If Geneva proves fruitless there will be reason to despair that no similar substitute movement can be initiated during our lifetime.

Aside from trade barriers the meeting discussed important and generally highly technical committee reports prepared by leading experts of all nations. Among the important approved recommendations are (1) that failure to work a patent be not considered forfeiture, but that owners of non-working patents be compelled to grant licenses to third parties; (2) that each country maintain a register of the owners of patents and only registered ownership shall be valid against third parties; (3) that motor taxes be levied on highway use and the receipts therefrom be employed for highway purposes; (4) that efforts be made to improve international telephony in Europe; and (5) that a conference be called further to unify the practice regarding bills of exchange. The meeting also recommended that efforts be continued to reduce double taxation on nationals residing abroad, the principle being that impersonal taxes should be levied at the source by the country of origin and that personal taxes should be collected by the country of domicile. Other recommendations dealt with shipping documents and details of international commercial arbitration.

Alberto Pirelli, a rubber manufacturer of Milan and a member of the Dawes Committee and of the Italian debt-funding committee to the United States, was elected president of the International Chamber. Amsterdam was selected as the site for the next convention. which is to be held in 1929.

Excellent Program Arranged for Salt Lake City Convention

Plans are maturing rapidly for the joint convention of the American Institute of Mining and Metallurgical Engineers and the Western Division of the American Mining Congress which will be held Aug. 22-26 at Salt Lake City, Utah. The meeting of the Institute will be under the auspices of the milling committee and the Utah section. The Congress will be responsible for the general arrangements of the convention and for the program on the first day. As now arranged, the program follows:

MONDAY, AUG. 22.—AMERICAN MINING CONGRESS

Forenoon—Addresses and papers.
Afternoon—Continuation of program.
Evening—Showing of U. S. Bureau of Mines film, "The Story of Copper."

TUESDAY, AUG. 23.—A.I.M.E.

Forenoon—Short talks presenting in a non-technical way the relation of flotation to mining and smelting in Utah, especially its economic benefits.

"Definition, Present Status, and Future of Flotation." By Ernest Gayford, General Engineering Co., Salt Lake City.

"Flotation and Utah-Delaware Mine." By Frank Wardlaw, Jr., superintendent, Utah Consolidated Mining Co., Bingham Canyon.

"Flotation and Park-Utah Consolidated Mines." By Paul Hunt, mine manager.

"Flotation and Utah Copper Mine." By E. E. Barker, engineer of mines, Utah Copper Co., Salt Lake City.

"Flotation and Lead Smelting (Blast Furnaces)." By Richard A. Wagstaff, assistant manager, American Smelting & Refining Co., Salt Lake City.

"Flotation and Lead Smelting (Sintering)." By W. H. Eardley, manager of smelter, Utah District, U. S. Smelting, Refining & Mining Co., Salt Lake City.

"Flotation and Lead Smelting (Zinc and Fluxes)." By A. B. Young, assistant manager, International Smelting Co., Salt Lake City.

"Flotation and Copper Smelting." By R. W. Senger, superintendent,

American Smelting & Refining Co., Garfield, Utah.

"How Flotation Has Broadened the Geologist's Field." By Paul Billingsley, consulting geologist, Salt Lake City.

"What Flotation Means to Utah." By W. Mont Ferry, managing director, Silver King Coalition Mines Co., Salt Lake City.

Afternoon—Papers on the more technical phases of flotation, especially those relating to copper ores.

WEDNESDAY, AUG. 24.—A.I.M.E.

Forenoon—Continuation of technical papers, especially those relating to flotation of lead and zinc ores.

Afternoon — Round-table discussion of refractories and reverberatory practice, and of mill balls and crushing.

Evening—Visit to Saltair Beach.

Among the papers available for discussion at the sessions Tuesday afternoon and Wednesday forenoon are the following:

"Flotation at International, Utah." By a member of International Smelting Co. staff.

"Flotation at U. S. Smelting, Refining & Mining Co. Plants." By A. B. Marquand, assistant to general manager, Salt Lake City.

"Flotation at Utah Apex Mine." By L. K. Jacobsen, metallurgist, Bingham.

"Flotation at Combined Metals Reduction Co. Plant, Bauer, Utah." By R. J. Evans, Jr., superintendent of flotation.

"Flotation at Consolidated Mining & Smelting Co. Plant." By R. W. Diamond, general superintendent of concentration, Trail, B. C.

"Flotation at the Hecla and the Callahan Plants." By W. L. Zeigler, mill superintendent, Hecla Mining Co., Gem, Idaho.

"Recent Flotation Practice at Inspiration." By Guy H. Ruggles and Henry F. Adams, Inspiration Copper Co., Inspiration, Ariz.

"The Forrester Cell Installation at the McGill Concentration." By E. H. Mohr, Nevada Consolidated Copper Co.

"Effect of Preferential Flotation at Mill and Smelter." By A. T. Tye, assistant superintendent, concentrator, Cananea Consolidated Copper Co. Cananea, Mexico.

"Flotation Mechanism, a Discussion of the Functions of Flotation Reagents." By A. M. Gaudin, University of Utah, Salt Lake City.

"Flotation Practice in the Cœur d'Alene District, Idaho." By A. W. Fahrenwald, U. S. Bureau of Mines, Moscow, Idato.

THURSDAY, AUG. 25.—AMERICAN MINING CONGRESS

Pleasure Trips—Facilities will be provided to enable those in attendance to visit Utah mines and plants.

Business sessions of the following organizations will be held on call during the meeting: Board of Governors, Western Division; Board of Directors, American Silver Producers' Association; General Tax Committee, American Mining Congress. All interested persons are invited to attend the public sessions.

Requests for additional information may be addressed to A. G. Mackenzie, Kearns Bldg., Salt Lake City, Utah.

Australian Institute Meets in Tasmania

Visit Mount Lyell Mines—President's Address Compares Conditions in Commonwealth With Those in America

THE ANNUAL MEETING of the Australasian Institute of Mining and Metallurgy was held on the west coast of Tasmania at the end of May with the president, R. M. Murray, general manager of the Mount Lyell Mining and Railway Co., Ltd., presiding. Several days were spent visiting the mines and works of the Mount Lyell company, including the Lake Margaret hydro-electric station. The new tunnel, which is being driven from two ends, was of much interest. One end begins on the 1,100 ft. level in the North Lyell mine, and the other at the flotation mill near Queenstown. The length of the tunnel when completed will be about 7,000 ft. on a grade of 1 in 200. The size of the tunnel is 9x9 ft. Two drills mounted on one bar are used in each heading. Progress of more than 60 ft. a week is being made in the mill end, and about 35 ft. a week in the mine end, where ground is much harder. Mechanical mucking shovels are to be installed, which should materially increase the speed of the work. When the tunnel is completed a large saving in the handling of the ore will be effected, and the need for pumping machinery above the 1,100 level will be eliminated.

The members also visited the Zeehan district, where the Electrolytic Zinc Co.'s mill was inspected; also the company's mines at Williamsford and Roseberry, which contain a considerable portion of the actual ore reserves.

In his presidential address Mr. Murray, who recently returned from a tour abroad, compared conditions existing in Australia and America. He said that the hugh scale of operations in some of the plants he had visited reduced overhead costs to a minimum and permitted large expenditure of capital on new plant; this also afforded wonderful opportunities for research work. The enormous home market for products and ready access to foreign markets were great advantages. Mining operations in Australia were on a comparatively insignificant scale, except, possibly, in the case of Broken Hill. This means high costs, and made research work on a plant scale impracticable. The latest machinery and plant were not available for inspection, and, if purchased, could be imported only at exorbitant cost. Except in favored places power and fuel were very expensive. Industrial conditions brought about by arbitration courts and similar tribunals and by special legislation had enormously increased costs and had reduced efficiency.

"After experience with these arbitration tribunals from their very inception," said Mr. Murray, "I am satisfied that they are a tragic failure. In the first place, they actually manufacture and encourage so-called disputes, so far as the refusal of an employer to concede the demands contained in a log served upon him, however extravagant these may be, constitutes a dispute between him and his employees. In the federal court such a refusal, happening in each of two states, constitutes an interstate dispute. The courts actually encourage strikes instead of preventing them, as we have not infrequently seen instances of organizations going on strike in order to have their case heard immediately, instead of waiting their turn on the list. The courts have taken control of industrial affairs out of the hands of experts, both employers and employees, and placed it in those of men who, however conscientious and keen to do the right thing by all concerned, are necessarily amateurs as regards the technical questions.

"The Navigation Act," added Mr. Murray "has also added to the troubles of the industry and made transport both uncertain and costly, freight between Australian ports being often higher than between those ports and Great Britain. Although I do not wish to underrate my native country, after a journey round the world I have returned to Australia with the conviction that the way we are managing this great continent is not beyond criticism. Unless we realize the facts we will gradually become a pastoral and agricultural country purely and simply, with possibly secondary industries fostered by high tariffs sufficient to supply the manufactured articles required by those employed in them. We have indulged in expensive experiments with national affairs long enough, and as soon as this is realized and we get down to solid business, I have no doubt that we will rapidly develop into the great nation that nature has so abundantly provided for, and in whose activities the mining industry will play by no means the least important part."

G. W. Thompson Delivers Armour Graduation Address

Gustave Whyte Thompson, chief chemist of the National Lead Co., delivered the graduation address of the Armour Institute commencement exercises in Chicago on June 9, and received the honorary degree of doctor of science.

Dr. Thompson was born in 1865 and has been chief chemist and a director of the National Lead Co. since 1892. He is also a director and vice-president of the Williams Harvey Co.; a director of the Williams Harvey Co., Ltd.; a director of the Titanium Pigment Co.; director and vice-president of the United Lead Co.; and director and treasurer, Metallurgical & Chemical Corporation. Dr. Thompson has long been interested in technical societies. He is a fellow of the American Association for the Advancement of Science; a member of the American Chemical Society, the Society of Chemical Industry, American Society for Testing Materials, Chemists' Club of New York, Metal and Rubber Club, and past president of the American Society of Chemical Engineers.

Recent Technical Publications

Reviews, Abstracts, and References

Index to the Mineral Resources of Alabama. Bulletin No. 28, 1926, Geological Survey of Alabama. By W. B. Jones. Pp. 250.

This bulletin is a revision of a similar bulletin issued in 1904. Obviously a great deal has been learned about the mineral resources of the state during the twenty-two years that elapsed from the time of publication of the early report, and the author has included in the new bulletin the essence of this accumulated knowledge. Following a brief introduction, the mineral deposits and industries are described in alphabetical order. The reader desirous of obtaining a well-balanced mental picture of the mineral industries of the state would probably have welcomed the inclusion of a longer general discussion involving production values or tonnages for recent years, figures which would indicate the relative importance of the various minerals. A feature of merit in the report is an index map of the state showing the locations of all important mineral commodities. Many sketch maps of parts of the state show the locations of deposits of individual minerals. The discussion of each commodity is concise, but sufficiently complete for the general reader, and select bibliographies at the end of each section direct one to more detailed sources of information. Forty-two illustrations add interest to the volume. Water-power resources are included. Alabama possesses a remarkable diversity of minerals, both metallic and non-metallic, and its mineral wealth is in many districts largely undeveloped. The report just published is of great value to the present or prospective mineral producer, and also to anyone desirous of obtaining general information on the subject. OLIVER BOWLES.

The Iron Industry in Prosperity and Depression, By Homer Bews Vanderblue and William Leonard Crum. A. W. Shaw Co., Chicago and New York City. Pp. 193. Price $7.50.

In a series of investigations Messrs. Vanderblue and Crum have applied to the iron and steel industry certain statistical methods for the analysis of recorded data. Such a vast deal of data is presented that it is well that the authors take care to say, in the preface, that they do not offer the work as an exhaustive analysis of *all* the material bearing on this particular industry. They do think, however, that they have done enough to point the way to corresponding analyses in other industries and to make conditions in the iron industry more readily understandable. The data selected for analysis are taken for the most part from the *Iron Age* and the *Iron Trade Review*, as well as the Annual Statistical Report of the American Iron and Steel Institute.

The authors have also sought to develop a method of forecasting conditions within the industry. Summarizing, they say that their analysis shows that there are certain statistical records which give useful statements of the current conditions in the principal industries which consume steel. In some cases these statistical records reflect an actual demand for steel so promptly that they are of use in studying current variations in demand. On the whole, however, they are merely of supplementary usefulness, furnishing aid in interpreting variations in demand which have already been recorded in the current data of the steel industry itself. Statistics of the individual industries consuming steel thus help to explain developments in the iron and steel industry and in a somewhat inadequate manner in pointing the way to the future trends. The authors express their doubt, however, that they can be utilized satisfactorily to develop a sensitive indicator of steel demand which will anticipate in its movements the variations recorded in the orders of the steel industry itself. It is apparent, therefore, that the forecasting problem in the iron and steel industry is reduced to the use and interpretation of certain series arising within the industry. The principal series of this sort are: The unfilled orders of a great factor in the industry, —the United States Steel Corporation; —the prices of the principal intermediate and final products of the industry, such as steel scrap, pig iron, and finished steel; and the prices of the stocks of the great steel-producing corporations.

The Scientific Principles of Petroleum Technology. By Dr. Leo Gurwitsch. Translated and revised by Harold Moore. D. Van Nostrand & Co., New York City. Pp. 474. Illustrated. Price, $8.

The author's avowed purpose in writing this volume is to give a general view of the scientific side of the subject of petroleum technology to the chemist interested in the petroleum industry. He divides his subject into three parts: Raw Material, Manufacture, and Products. In Part I, after discussing the chemistry and physics of the raw material and giving the characteristics of the most important crude oils, he devotes twenty-eight pages to the origin of petroleum. In conclusion Dr. Gurwitsch says:

"We see, therefore, that only the organic hypotheses of the origin of petroleum are capable of explaining readily its chemical composition and the remarkable fact of optical activity, whilst the inorganic hypotheses cannot suffice in this respect without the help of *ad hoc* auxiliary assumptions, devoid of experimental basis and of little probability." The section on manufacture is in turn divided into three parts, on Preliminary Treatment, Distillation, and Refining. The third division of the book, that on products, has five chapters, one each on benzine, illuminating oils, lubricating oils, paraffin wax, and vaselines. Thus the book is seen to be primarily for the petroleum chemist. The mining engineer and geologist interested in petroleum will also find it convenient for reference upon occasion.

South Kalgurli Practice—The May number of *Chemical Engineering and Mining Review* (Melbourne, Australia, price 9d.) contains a four-page article entitled "Mining and Treatment Methods at the South Kalgurli Gold Mine." The author, A. E. Paton, metallurgist of the company, describes in detail the methods used on the property.

Highway Bridge Location—The various factors which influence the selection of locations for highway bridges are discussed by C. B. McCullough, of the Oregon State Highway Commission, in Bulletin 1486-D of the U. S. Department of Agriculture, entitled "Highway Bridge Location." The subjects considered include the location of minor bridge structures, costs involved in the location of large structures, maintenance considerations affecting bridge location, alignment, grade-line treatments, traffic influence on bridge location, and location over navigable waters. Copies of the bulletin may be obtained, as long as the supply lasts, by application to the Department of Agriculture, Washington, D. C.

Carburetion of Kerosene—Bulletin No. 27 of the Engineering Experiment Station of Purdue University, "Carburetion of Kerosene," presents data to provide additional information concerning the effect of fuel volatility on the carburetion problem, to show how an engine operating on kerosene reacts to variations in the strength and temperature of the mixture, to point out the optimum temperature for satisfactory performance, and to specify the correct mixture ratios for economy and for power. Requests for copies of the bulletin should be addressed to the Director, Engineering Experiment Station, Purdue University, Lafayette, Ind.

Precipitation of Copper—In Bulletin 795-C of the U. S. Geological Survey, T. S. Lovering discusses "Organic Precipitation of Metallic Copper." The text is a record of a study made of deposits of spongy masses of native copper, found in a bog near Cooke, Mont., which are believed to have been precipitated by organic matter. Copies of the bulletin may be obtained for 5c. from the Superintendent of Documents, Washington, D. C.

Flotation of Tin—The June number of *The Mining Magazine* (London, price 1s.) contains an article of three pages, "Flotation of Tin Ores," by A. C. Vivian. The author gives an account of the use of cupferron in activating the surface of cassiterite and making it amenable to flotation.

Trend in Fuels—"Impending Changes in Our Use of Fuels," by Arthur D. Little, has been prepared in pamphlet form, and so long as the limited edition lasts copies will be mailed in response to requests addressed to Engineering Foundation, 29 West 39th St., New York City.

Personal Notes

W. W. Mein left San Francisco on July 4, on his way to Paris.

A. B. Emery, general manager of the Messina Copper Mine, has returned to Cape Town.

Dr. J. Coggin Brown, of the Indian Government Geological Survey, is now in London.

Adolph Knopf, of the geological department of Yale University, is vacationing in California.

Dr. James Moir, government chemist to the South African Mines Department, recently left Cape Town for England.

A. E. Payne, manager of the Van Ryn Deep, Ltd., with Mrs. Payne, son and daughter, has left Johannesburg.

Lewis Douglas has gone to Northern Rhodesia as metallurgist on the staff of Rhodesian Congo Border Concession, Ltd.

W. L. Cumings, geologist of the Bethlehem Steel Co., has just returned from a three months' trip to Spain and North Africa.

Edmund Jussen, mining engineer of San Francisco, has returned from a professional trip to Nevada in company with **H. A. Cohen**.

Louis A. Wright, consulting engineer, of San Mateo, Calif., recently arrived in New York after several months in Europe on professional business.

Philip R. Bradley, of San Francisco, is at Juneau, Alaska, and will make his annual trip to Mayo, Y. T., in the interest of the Treadwell-Yukon Company.

Livingston Wernecke, general superintendent of the Treadwell-Yukon, is on his way to Mayo, Y. T., after a visit to Ottawa, Canada, and to San Francisco.

C. V. Theis, recently appointed junior geologist of the Geologic Branch of the U. S. Geological Survey, has been assigned to A. A. Baker's party in southeastern Utah.

T. H. Rea, vice-president of the Bathurst Mines, Ltd., has returned from an inspection of the property in the Narrow Lake area of the Patricia district of Ontario.

J. V. Desauiniers has been appointed managing director of the Destor Mines, Ltd., operating in the Rouyn area of Quebec, and has gone to make an inspection of the property.

Leo Hannebach, engineer for the American Smelting & Refining Co., has returned to Salt Lake headquarters from a two months' trip to Utah, California, and Nevada camps.

M. Wallace Woolley, manager of the ore-purchasing department of the United States Smelting, Refining & Mining Co., has returned from a tour of Nevada and California camps.

W. F. Schumacher, of Columbus, Ohio, formerly owner of the Schumacher mine, has entered the Kamiskotia mining field of northern Ontario, where he has secured a group of eighteen claims.

P. S. Smith, of the Alaskan Branch of the U. S. Geological Survey, sailed from Seattle on July 2 for Nome, Alaska, to conduct geologic investigations in Seward Peninsula and mining camps in western Alaska.

D. E. A. Charlton has acquired an interest in *Modern Packaging*, a monthly magazine published in New York City by the Breskin-Charlton Publishing Corporation, of which Mr. Charlton is vice-president.

F. M. Leonard, who has been serving as active chief of the minerals division of the U. S. Tariff Commission, was on July 1 given the rank, title, and salary of chief of division. Mr. Leonard is a graduate of the Minnesota School of Mines. He has had a number of years' experience in the operating branch of mining, which included five years in South America, most of which was spent at the Cerro de Pasco properties. On completion of his military service with the Corps of Engineers, Mr. Leonard spent three years in valuation work on public utility and manufacturing properties, after which he joined the technical staff of the Tariff Commission.

F. M. Leonard

Dr. Douglas Wright, formerly of the Dome Mines, is in charge of the development of the properties of the Narrow Lake Mines, Ltd., and the Leonard Narrow Lake Mines, Ltd., in the Patricia district of northern Ontario.

R. C. Emmons, of the Canadian Geological Survey, is engaged in mapping a large Keewatin area north of Woman River, in the Patricia district, which contains numerous iron formations and minor occurrences of gold and lead-zinc.

H. M. Taberer, native-labor adviser to the Transvaal Chamber of Mines, has left Johannesburg, en route to Geneva, where he will attend a conference of experts, appointed by the League of Nations, on the subject of the employment of native races.

W. H. Corbould, managing director of Mount Isa Mines, Ltd., Queensland, consequent on the decision of the Anglo-American Corporation of South Africa not to exercise its option to take 550,000 Mount Isa £1 shares, has left Australia for London, on a second mission connected with the finances of the first-named company.

Hon. J. E. Perrault, Minister of Mines and Fisheries for the Province of Quebec, accompanied by engineers of his department, will make a tour of the northwestern gold and copper fields of the province in July. The minister will proceed to the Gaspe Peninsula mines on an inspection tour. The Gaspe belt road, which will bring the mining district of that section in closer contact with the distributing centers, is now nearing completion.

A. H. Miller, of Casper, Wyo., has severed his connections with the Rocky Mountain division of the Standard Oil Co. (Ind.), to accept the position of mechanical superintendent of the Patiño Mines & Enterprises Consolidated, of Oruro, Bolivia, S. A. Mr. Miller has spent considerable time in Latin America, including several years with the Chile Copper Co. at Chuquicamata, Chile. He sailed from New York on July 7 for Bolivia.

H. G. Moulton, consulting engineer, of New York City, chairman of the committee on ground movements and subsidence of the A.I.M.E., was in Houghton, Mich., on July 1 to confer with members of the committee in the Michigan copper district. **W. R. Crane**, superintendent of the experiment station at Birmingham, Ala., is making an exhaustive study of ground movements and subsidence in the Michigan copper country, on assignment by the U. S. Bureau of Mines.

A. J. M'George, mining engineer, who has been associated with mining in North Queensland, Australia, for several years, has returned to Melbourne after a visit to the Malay States and Siam on behalf of the Commonwealth Tin Syndicate. Mr. M'George first went to North Queensland fifteen years ago, when he had charge of mining operations for the Chillagoe company, and later was engaged at Cloncurry in directing smelting for the Mount Cuthbert company at the Mount Elliott company's works.

Obituary

Sherwood Aldrich, president of the Ray Consolidated Copper Co., and associated with industrial enterprises and copper properties in the West, died in New York on July 1. He was fifty-nine years old.

William Henry Solomon, late secretary of the New Jagersfontein (Diamond) Co., Ltd., died recently in South Africa. He was seventy-three years old. He went to Kimberley in the eighties and had held his position with the Jagersfontein company for thirty-one years.

Milton Fairlee, one of the oldest Bisbee pioneers, died recently at Benson, Ariz. Fairlee is said to have sunk the Neptune shaft, which has now been covered up by steam-shovel operations on Sacramento Hill, but was originally one of the first shafts sunk after the Phelps Dodge Corporation took an interest in the district.

Market and Financial News

Outlook for Zinc Corporation Good, Despite Lower Metal Prices

AT THE sixteenth annual meeting of the Zinc Corporation, Ltd., an important producer of zinc, lead, and silver in the Broken Hill district in Australia, the chairman declared that, though operating profits must necessarily continue to be affected by the lower prices of metals, the resources of the mine, coupled with the strong financial position of the company, should warrant the shareholders in regarding the future with equanimity. He said that the gross profit from the mines for the year amounted to £482,000, against nearly £565,000 in the preceding twelve months. London and Melbourne expenses were somewhat lower, but Dominion taxes and mining royalties were considerably greater by reason of the larger profits of the last two years. There was carried forward to appropriation account an amount of £424,000, against approximately £545,000 in 1925. The company had provided nearly £27,000 to restore the "mine development and new plant appropriation account" to the figure of £100,000. Following the usual practice, the cost of the additional 5,000 shares of the Broken Hill Associated Smelters had been written off and £20,000 carried to reserve account. Payment had been made of the fixed preferential dividend of 4s. per share on the preference shares, as well as an interim participating dividend of 3s. per share on the ordinary and preference shares. He recommended that a final participating dividend of 4s. per share be paid, leaving an amount of nearly £22,000 to be carried forward, as against £13,373 brought forward from 1925.

A year ago the late chairman had advised in no uncertain terms to regard 1925 as a "peak" year, and not to expect a continuance of such profits in 1926. This warning was justified by present results. The profit, which in 1925 reached nearly £545,000, fell to £424,000 during the last year. This fall resulted from the loss of about a month's productive operation, due to water shortage at Broken Hill and the reduction in metal prices. But for the former, ore output would have created a record for the company. On the other hand, the drop in the prices of metals had been serious. The difference between the average of 1925 and 1926 was no less than £4 15s. per ton for lead, £2 2s. 4d. per ton for zinc, and 3.3293d. per ounce for silver. There had since been a further substantial fall, and the differences between the average prices of 1925 and those ruling recently in London were not less than £11 6s. per ton of lead, £7 3s. 9d. per ton of zinc, and 5.6951d. per ounce of silver. The drop in prices, said the chairman, was serious enough to affect the world's production on the one side, and to stimulate consumption on the other; but the re-establishment of stable market conditions took time, and mining companies were confronted by the likely prospect of a period of irregularity in prices, with average levels substantially below those of the last few years. Revenue from silver had also been affected by reduced prices, resulting in the main from the recommendation of the Indian Currency Commissioner; and until some definite announcement was made by the Indian Government as to its policy with regard to the retention or sale of silver coins it would be rash to make any prediction as to the course of prices.

Turning to the subject of the mine at Broken Hill, the chairman said that it would be noticed that the estimate of the ore reserves at Dec. 31 last was slightly lower than at the same date last year. That was because of the fact that the results of the year's development work would not be fully disclosed until the next estimates at the end of 1927 had been made. He thought he ought also to point out that, pending the completion of means for its economic extraction, the company had not included in the reserves the ore developed in the "Zinc Lode." At the end of 1925 these were calculated at 84,160 tons, with an average assay of 17.6 per cent zinc and 5.9 per cent lead; at the end of 1926 the tonnage had been raised to 172,784, assaying 18.1 per cent zinc and 6 per cent lead. It was satisfactory to observe that the ore continued to stope with values in excess of those included in the figures of the estimated ore reserve. Altogether, the position at the mine was eminently satisfactory.

Arsenic Situation Improves

Stocks of both crude and refined arsenic in the United States at the end of May were the lowest in several years, according to the American Bureau of Metal Statistics, and equal to only about three months' production. Production declined considerably in both April and May, being several hundred tons a month less than deliveries.

Imports of white arsenic during May amounted to 3,255 tons as follows: from Belgium, 56 tons; Mexico, 2,526; Canada, 612: Japan, 61. Total for first five months of 1927, 6,616 tons, compared with 2.240 tons for the corresponding period of 1926.

Data for the first five months of the year, in tons of 2,000 lb., follow:

	Crude				Refined	
		Deliveries				
1927	Produced	Refiners	Consumers	Stock at End	Produced	Stock at End
January	1,414	1,105	295	2,725	913	1,983
February	1,147	898	587	2,387	810	2,251
March	1,380	1,142	247	2,378	1,030	2,230
April	1,075	752	493	2,208	925	2,059
May	905	1,454	227	1,432	683	1,718

The market for white arsenic has been reasonably good recently, producers reporting the sale of a few carloads every week. Both insecticide and glass makers have been in the market, and a good tonnage is also being used for weed killer. The price on wholesale lots seems uniformly 3¾c. a pound, though if supplies become at all scarce this is likely to be revised upward, as it no more than pays for handling and delivery, white arsenic being a byproduct of smelting that must be disposed of in any case. The boll weevil has not been particularly active in the cotton districts of the South for the last two years, but early reports indicate that it may be more of a menace this summer, and, if so, calcium arsenate may be in good demand, which would, in turn, affect the white arsenic market favorably.

Statistical Notes

Central Eureka Mining Co., operating on the Mother Lode near Sutter Creek, Calif., recently levied an assessment of 5c. per share. Two causes have operated to bring about the present condition, one being the payment out of earnings for the adjoining property, which was purchased for $150,000, and likewise additional equipment, new land, and timber properties. The other was the faulting of an orebody.

Since Nov. 20, 1919, dividends to the amount of $337,649 were paid to stockholders. Extra exploratory work on the 4,700 level in heavy ground and tax payments depleted the treasury to only $16,000. The assessment is expected to provide a sufficient amount to open up the 4,700 level.

United States S. R. & M. Co. issued a rather unexpectedly optimistic report for the five-month period of operations ending with May 31, at the time of declaring the regular quarterly dividend of 87½c. payable on July 15. Estimated net income was $1,469,163, after interest, depreciation, depletion, and amortization, equivalent, after preferred dividends, to $2.16 a share earned on outstanding 351,117 shares of common stock. This compares with $1,463,680, or $2.14 a share, in same period of previous year, when metal prices were generally higher.

German Potash Syndicate's sales in May amounted to 43,071 tons of pure potash, compared with 41,808 tons in May, 1926. Sales in the first five months of the current year total 632,044 tons, against 518,586 tons in the first five months of last year.

The Market Report

Active Buying of Copper Today Feature of Otherwise Dull Week in Metal Markets

New York, July 6, 1927—Until today the non-ferrous metal markets had been generally dull, with tendencies toward weakness. The Fourth of July holiday apparently began last Friday and did not end until this morning. Today, however, an unusually large business was done in copper at 12.50c. and producers seem confident that a buying movement has started. Lead has been quiet, and prices are lower than a week ago. Much the same situation exists in zinc, silver, tin, and quicksilver. Antimony and platinum have been stagnant, but prices are practically unchanged. A reduction in the price of bismuth has taken place.

Copper Stiffens to 12.50c.

The contest that has been going on for weeks between buyers and sellers of copper appears to have ended with neither side the undisputed victor. Producers who have been virtually out of the market, quoting nominally 12.625c. or higher, have, with one or two possible exceptions, come to the 12.50c. level today. On the other hand, consumers who had hoped to break through the 12.50c. figure have had little success, although at least one good-sized sale was made at 12⅜c. for delivery in the New York district and a still larger tonnage was booked for delivery in the so-called Middle West at 12.50c. With excellent buying for Connecticut delivery at 12.50c. today, it seems as though the events of last February and April, when bottom was touched at this figure, have been repeated and that, even if no great improvement is experienced, at least no further decline is to be expected in the immediate future. Although the leading brass manufacturer was responsible for the bulk of the buying, several other interests were represented. There is little question that other important consumers are under-bought for July and August and that they will necessarily join the ranks of the buyers, thereby creating a buying movement of moderate proportions. Most of the orders today have been for August and September delivery, with a lesser quantity for July. The foreign price of the export association has remained at 13c. c.i.f., but business has been small at this level. Some f.a.s. sales have been made at 12.60c. and 12.65c. during the week. Indications of some curtailment in production continue to become evident, though whether this will be of sufficient moment to help the price situation remains to be seen.

London Drops Weaken Lead

Five successive days of lower lead prices in London made it necessary for prices on this side to be cut also if foreign ore lead were to be kept out of the country, so the American Smelting & Refining Co. reduced its contract price of New York lead from 6.40 to 6.30c. on Friday, July 1. The decline, coming just before the Independence Day holiday, had no effect in stimulating business, and the renewed decline in London yesterday scared off any buying that had accumulated over the

Average Metal Prices for June, 1927

Copper:	
New York Electrolytic	12.370
London Standard Spot	54.030
London Electrolytic Spot	59.881
Lead:	
New York	6.414
St. Louis	6.150
London Spot	24.438
London Forward	24.750
Silver:	
New York	56.769
London	26.203
Sterling Exchange	485.183
Zinc:	
St. Louis	6.213
London Spot	28.598
London Forward	28.613
Tin:	
99 per cent	64.226
Straits	67.466
London	296.006
Quicksilver	118.096
Antimony	12.447
Platinum:	
Refined	72.000
Crude	62.500
Aluminum, 98 per cent	26.000

Daily Prices of Metals

June / July	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St. L.	St. L.
30	12.175@12.275	64.75	65.75	6.40	6.125	6.15@6.175
1	12.225	64.625	65.625	6.30	6.00@6.05	6.125@6.15
2	12.225	64.625	65.625	6.30	6.00@6.05	6.10@6.15
4	Holiday	.....	.....	.....	.....	.....
5	12.20	63.125	64.50	6.30	6.00	6.10@6.15
6	12.275	63.25	64.50	6.30	6.00	6.15
	12.230	64.075	65.200	6.320	6.035	6.140

Average prices for calendar week ending July 2, 1927, are: Copper, 12.250; 99 per cent tin, 64.708; Straits, 65.938; N. Y. lead, 6.367; St. L. lead, 6.106; zinc, 6.177; and silver, 56.438.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis: i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

June / July	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
30	53 7/16	54	59½	300	285½	23½	23⅞	28⅛	28 1/16
1	53½	54 1/16	59½	300⅛	283⅜	23½	23⅞	27 13/16	27⅞
4	53½	54	59½	295	282¾	23 3/16	23 9/16	27 13/16	27 11/16
5	53⅜	53⅞	59½	291	282	22⅞	23 5/16	27½	27⅜
6	53 9/16	54⅛	59⅝	291½	282¾	23 5/16	23¾	27 13/16	27 11/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

June / July	Sterling Exchange "Checks"	Silver		Gold London	July	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
30	4.85⅛	56½	26 1/16	84s11½d	4	Holiday	...	25⅞	84s11¼d
1	4.85⅛	56⅛	26 1/16	84s11½d	5	4.85¼	56⅛	25⅞	84s10½d
2	4.85¼	56⅛	26	.....	6	4.85¼	56⅛	25⅞	84s11¼d
					Avg.		56.225		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-half cent premium.

week end. As a result, the week has been a quiet one, some sellers doing practically no business and others being well below their average. Nevertheless, July production has been pretty well booked, and a good hole eaten into the expected August output; so the domestic situation is excellent. The only trouble arises from the quiet market and declining prices abroad; it is not felt that the market here can well absorb the Mexican ore lead, so prices are cut to accord with the London reductions. Based on post-war experience, lead at £23 and less looks very cheap in London, but it must be remembered that £15 was a good price before the war, and important metallurgical improvements have been made in lead production as well as in copper.

The improvement in London today was encouraging, but the market here remained very quiet.

Corroding grades command premiums of $2@$3 a ton over common lead.

Dull Zinc Market

Sales of zinc in the domestic market have been in less than normal volume, and prices are easier than a week ago. At the same time producers have not endeavored to force an unwilling market, and the decline in price has been comparatively small. There is little profit to be made in smelting $41 and $42 concentrate and selling slab zinc at 6.10c. and 6.15c.; and for this reason producers prefer to hold their metal. Mine production in Joplin should be particularly small this week, for the reason that many of the largest properties were closed down for four days or more over the holiday. The premium on Brass Special is not more than 2½ points. High-Grade is offered in the New York territory at 8c. for small spot lots.

Spot Tin Easier

The premium on spot and prompt tin continues to decline, October deliveries being quoted today at only about 1¼c. below spot Straits. Forward tin has declined somewhat also, but not so much as spot. Buying has been stimulated somewhat by the lower prices, but the market, like that for the other metals, has been quiet. The visible supply of tin in the United States was 8,724 long tons at the end of June, compared with 7,709 at the end of May; and in the world, 15,638 long tons, compared with 14,655 a month before. The June shipments of 10,681 long tons, were divided as follows: Straits, 7,607; Banka, 1,418; Standard, 1,251; Chinese, 291; and Australian, 114.

Foreign Exchanges

Closing cable quotations on Tuesday, July 5, were as follows: francs, 3.91§c.; lire, 5.515c.; and marks, 23.70c. Canadian dollars, $\frac{5}{32}$ per cent discount.

Silver Inactive at 56⅛c.

The silver market during the last week has been quiet and featureless, with a slightly downward tendency. India has shown only a moderate interest, generally at rates slightly below those quoted locally. China has been on both sides of the market. The outlook is uncertain, but price movements appear likely to be narrow.

Mexican Dollars (old Mexican pesos): June 30th, 42⅞c.; July 1st, 42⅝c.; 2d, 42½c.; 4th, holiday; 5th and 6th, 42½c.

Zinc Blende and Lead Ore Prices Unchanged

Joplin, Mo., July 2, 1927

Blende

High	$44.10
Premium blende, basis 60 per cent zinc	$41.00@42.00
Prime Western, basis 60 per cent zinc	40.00@41.00
Fines and slimes, 60 per cent zinc	38.00@40.00
Average settling price, all zinc	40.23

Galena

High	$81.40
Basis 80 per cent lead	$78.00@80.00
Average settling price, all lead	79.94

Shipments for the week: Blende, 11,690; galena, 981 tons. Value of shipments for the week, $548,730.

An abandonment of the usual methods of price quoting, in order to obtain a tonnage without advancing quoted prices, is apparent, as Prime Western is reported sold as high as $42 basis. Last week this plan enabled buyers to procure 15,320 tons, but it obtained for them only 10,930 tons this week. One buyer has taken half the tonnage purchased in the last two weeks. Another buyer was in the market in mid-week offering $80 basis for lead, but all quotations today dropped back to $78.

Platteville, Wis., June 25, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$42.75
Lead Ore	
Lead, basis 80 per cent lead	$84.00

Shipments for the week: Blende 1,294 tons: lead, none. Shipment for the year: Blende, 32,538; lead, 840 tons. Shipments for the week to separating plants, 2,748 tons blende.

Platteville, Wis., July 2, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$43.75
Lead Ore	
Lead, basis 80 per cent lead	$84.00

Shipments for the week: Blende, 1,222 tons; lead, 50 tons. Shipment for the year: Blende, 33,760; lead, 890 tons. Shipments for the week to separating plants, 2,237 tons blende.

Steel Market Dull, With Prices Firm

Pittsburgh, July 5, 1927

The volume of steel buying has decreased a trifle more in the last week, but the substantial decrease had occurred in the preceding fortnight. The steel market is now decidedly dull, with less business going than a year ago or two years ago. From about Feb. 1 until early in June steel production ran slightly ahead of rates a year previous, there being then a dip under last year's rate. This month's production may run 10 per cent under that of July, 1926, and there is little prospect of such recovery in August as occurred last year, predictions rather being for September to show distinct improvement.

Steel prices are holding very well, perhaps a shade better than a week ago. The small size of individual orders is a help to sellers in maintaining prices.

Pig Iron — Bessemer and basic at Valley furnaces are off 50c., the decline being ascribed to offerings by steel companies. Bessemer, $18.50; basic, $17.50; foundry, $18, f.o.b. Valley furnaces.

Connellsville Coke—The spot furnace coke market has stiffened to $3, spot foundry becoming steadier at its former range of $4@$4.75. Demand continues light.

Other Metals

Quotations cover large wholesale lots, f.o.b. New York, unless otherwise specified. London prices are according to latest mail advices.

Aluminum — Per lb., 99 and 98 per cent grades, price of leading interest, 26c.; outside market, 25.30@25.80c. Consumption steady. London, 98 per cent, £104@£106 per long ton for domestic consumption.

Antimony—Per lb., duty paid, spot: Chinese brands, steady all week at 12c.; August arrival ¼c. higher. Little interest shown. Cookson's "C" grade, spot, 17¾c.

Chinese needle, lump, 8c. Standard powdered needle, 200 mesh, 10c. White oxide, Chinese, 99 per cent Sb_2O_3, 16½c. Nominal.

Bismuth— Per lb., in ton lots, $1.85@$2.10. London, 7s. 7d. Prices in both domestic and foreign markets reduced on July 1.

Cadmium — Per lb., 60c. London, 1s. 10d. for Australian metal.

Cobalt—F.o.b. Canadian works, per lb., shot, 96@98 per cent, $2.50. Black oxide, 70 per cent, $2.10. London, 8s. 6d.@10s. for metal; 8s. for black oxide; 8s. 10d. for gray.

[1]**Germanium Oxide**—Per gm. in 300- to 500-gm. lots, $5.

Iridium—Per oz., $110@$112 for 98@99 per cent sponge and powder. London, £32½ in iridio-platinum; £17@£19, nominal, for sponge and powder.

[1]**Lithium**—Per lb., 95@96 per cent grade in 1- to 5-lb. lots, $65.

Magnesium—Per lb., in ton lots: 8-lb. ingots (3x3x15 in.), 75c.; 3-lb. sticks (1⅜x33 in.). 80c.; 10-oz. sticks (1x12 in.), 90c. Market firm. London, 3s. 9d.@4s. 3d. for 99 per cent ingots or sticks.

[1]**Molybdenum**—Per kg., 99 per cent, $25; chemically pure metal, $80.

Monel Metal—Base price for shot, 32c. per lb.

Nickel—Per lb., ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade), for single lots of spot metal. London, £170@£175 per long ton according to quantity. Demand continues good.

Osmium—Per oz., $60@$65; London, £15@£18.

Palladium—Per oz., $55@57. Small lots bring up to $60. Pure metal as a constituent of crude platinum, nominal. London, £11@£12. Nominal.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Platinum—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $72. Open market cash sales of large lots at $65@$67. Pure metal as a constituent of crude platinum, $62, nominal. Market still very dull.

London, £13 15s. per oz. for refined; crude and scrap, nominal.

Quicksilver—Per 76-lb. flask, range for the week, $122@$121. San Francisco wires $117.67. London firm at £20½@£21½.

Radium—Per mg. radium content, $70.

Rhodium — Per oz., $55; London, £8@£11½. Nominal.

Ruthenium—Per oz., $40. Nominal. London, £6@£7½.

Selenium — Black, powdered, amorphous, 99.5 per cent pure, $1.90@$2 per lb. in ton lots. London, 7s. 6d.@7s. 8d.

Tantalum—Bar and heavy sheet, chemically pure, $200 per kg. Firm.

Tellurium—Per lb., $2.

[1]**Thallium Metal**—Ingot, 99 per cent pure, $12 per lb. in 25-lb. lots.

Tungsten Powder—Per lb., 97 to 98 per cent pure, $1.05.

[1]**Zirconium Metal**—Per lb., 98 per cent grade, $15 in 5- to 10-lb. lots.

Metallic Ores

Chrome Ore—Per long ton, f.o.b. Eastern shipping points, $22@$24 for 45 to 50 per cent Cr_2O_3 ore. Prices firm.

Iron Ore—Lake Superior ores, per long ton, lower Lake ports:

Mesabi, non-bessemer, 51½ per cent iron, $4.25. Old Range, $4.40.

Mesabi, bessemer, 51½ per cent iron, $4.40. Old Range bessemer, 51½ per cent, $4.55.

Eastern ores, cents per unit, delivered at furnaces: Foundry and basic, 53 to 63 per cent, 9@10½c.

Foreign ores, f.o.b. cars Atlantic ports, cents per unit:

Swedish and Norwegian, low-phosphorus, 68 per cent, 10½@10¾c.

North African, low-phosphorus, 10½@11½c.

Spanish foundry or basic, 50@54 per cent, 9@9½c. Nominal.

Swedish foundry or basic, 66@68 per cent, 9@9½c.

Manganese Ore—Per long ton unit of Mn, c.i.f. North Atlantic ports, minimum 47 per cent Mn, 36@38c. Caucasian (washed), 53@55 per cent, 38@40c.

[1]Chemical grades, powdered, coarse or fine, 82@87 per cent MnO_2, Brazilian and Cuban, $70@$80 per ton in carloads.

Molybdenum Ore—Per lb. of MoS_2, for 85 per cent MoS_2 concentrates f.o.b. Denver, Colorado, 50c.

Tantalum Ore—Per unit of Ta_2O_5, basis 65 per cent ore, $12@$15.

Titanium Ore—Ilmenite, 52 to 60 per cent TiO_2, f.o.b. Atlantic seaboard, $10@$15 per gross ton, according to grade and impurities. Low-grade domestic, 32 to 35 per cent, about $7@$8 per gross ton. Rutile, 96 per cent concentrate, 11c. to 13c. per lb.

Tungsten Ore—Per unit of WO_3, N.Y.: Wolframite, $10.50@$10.60; Western scheelite, $10.75@$11. Market dull, prices largely nominal.

Uranium Ore—Minimum 5 per cent U_3O_8, per lb. of U_3O_8 contained, nominal at $5, f.o.b. Montrose, Colo.

Vanadium Ore — Containing 5 per cent V_2O_5, nominal at 25c. per lb. of V_2O_5, f.o.b. Montrose, Colo.

Foreign concentrate (lead vanadate) 12 to 18 per cent V_2O_5, 55@60c. per lb. V_2O_5, duty paid, seaboard. Nominal.

Non-Metallic Minerals

Prices received for non-metallic minerals vary widely and depend upon the physical and chemical characteristics of the commodity. Hence the following quotations can serve only as a general guide to the prices obtained by producers and dealers in different parts of the United States for their own product. In the last analysis the value of a particular non-metallic mineral can be ascertained only by direct negotiation between buyer and seller.

[1]**Amblygonite**—8@9 per cent lithium oxide, $50@$60 per ton, f.o.b. mines.

Asbestos—F.o.b. *Quebec* mines, tax and bags included, prices quoted by leading interest, per ton:

Crude No. 1, $525; crude No. 2, $325; spinning fibers, $200; magnesia and compressed sheet fibers, $125@$165; shingle stock, $70@$80; paper stock, $40@$45; cement stock, $25; short fibers, $10@$20; floats, $15. Market strong for all grades above paper stock. Higher prices forecast for 1928 delivery on all of the better grades.

No. 1 Rhodesian crude, $425; No. 2, $325@$350 per ton, c.i.f. New York.

Barytes—F.o.b. mines, bags extra:

Georgia: Barytes ore, crude, per long ton, $7.25@$7.50. Wet ground, off-color, $12@$18, depending on analysis. Fair demand.

Missouri: Water ground and floated, bleached, $23; $25 in less than car lots, f.o.b. works. Crude ore, 93 per cent $BaSO_4$, not to exceed 1 per cent iron, per ton, $8, f.o.b. mines. Market good.

Bauxite—No. 1 chemical ore, over 60 per cent Al_2O_3, less than 5 per cent SiO_2, and less than 2 per cent Fe_2O_3, $8 per long ton, f.o.b. *Georgia* mines.

Foreign, per metric ton, c.i.f.: Dalmatian, low SiO_2, $5@$6.50; Istrian, $5.50@$7; French, red, $6@$7.50.

Borax—Carload lots, in bags, per lb.: crystals, 4¼c.; granulated or powdered, 4c.; f.o.b. plant, Pennsylvania. Market slow.

[1]**Celestite**—90 per cent $SrSO_4$, finely powdered, $27 per ton in carload lots.

Chalk—Crude, in bulk, per ton c.i.f. *New York*, $4.75@$5.

China Clay (Kaolin)—F.o.b. *Virginia* mines, per ton; crude, lump, No. 1, $7; crude No. 2, $5.50; washed, $8; powdered and air-floated, $10@$15; ground, $7@$10.

Florida, pressed pottery, bulk, $13; ground, No. 1, $20; No. 2, $15. Sprayed mineral flour No. 1, $20; No. 2, $17.

1A grades, domestic, $16@$17, f.o.b. *Delaware* plants in carload lots. Seasonal slowness.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Imported English, f.o.b. American ports: Lump, $13@$21; powdered, $45@$50.

Diatomite—Per short ton, f.o.b. plant: Kiln-fired brick, $65; kiln-fired aggregate, ¼ in., $45; insulating powder, $30; natural aggregate, ¼ in., $20; air-floated powder, $40. Over 85 per cent silica, 98 per cent through 200 mesh, $15@$16, depending on quantity. Market fair; some price cutting.

Emery — F.o.b. *Pennsylvania* and *New York* in 350-lb. kegs, per lb.: Greek Naxos, 6½c.; Turkish, 6½c.; Khasia, 5½c.; domestic, 3½c. Market good.

Feldspar—F.o.b. mine or grinding plant:

North Carolina: No. 1 pottery grade, $5.75@$7 per long ton. Market fair for best grades; dull for others.

New Hampshire: Pottery grade, $8 per ton; soap grade, $8.50. Prices easier.

New York: Per ton, f.o.b. cars, No. 1 crude, $9. Market fair.

Tennessee: No. 1, pottery, 140 mesh, $16 per ton; 200 mesh, $18. No. 2, enamel, 140 mesh, $14; 200 mesh, $16.

Maine: Best pottery grade, ground, $19 per ton. Market fair.

Fluorspar—F.o.b. *Kentucky* and *Illinois* mines, per short ton:

Gravel, not less than 85 per cent CaF_2, and not over 5 per cent SiO_2, $17@$18. Quiet; odd lots offered at concessions from $18 price. Foundry lump, 85-5, $20. Ground, 95 to 98 per cent CaF_2, and not over 2½ per cent SiO_2, $32.50 in bulk; $36.50 in bags or barrels. Acid lump, 98-1, $30 in car lots. Market inactive.

New Mexico: 85-5 gravel, $16; 85-5 lump, $16; 93-3 lump, $19; 96-3, ground 100 mesh, $35, bulk; $37.50 bags. Market good.

Foreign spar, duty paid, $16@$16.50, tidewater. Prices easier.

Fuller's Earth — Per ton, f.o.b. *Florida:* 16 to 30 mesh, $16.50; 30 to 60 mesh, $18; 60 to 100 mesh, $15; 100 mesh up, $8; 200 mesh up, $15. Market fair at unchanged prices.

Powdered, import duty paid, $24@$25 per ton.

Garnet — Domestic, per ton, f.o.b. mines, $85. Market easy.

Spanish grades, $60, c.i.f. port of entry.

Gilsonite—Per ton, carload lots, f.o.b. mines *Colorado:*

Selected grade, $33; seconds (mine run), $22.50.

Graphite—F.o.b. *New York*, per lb.: Ceylon lump, 7@8c.; chip, 6½@7c.; dust, 3@5c.; Madagascar flake, 7@8c. Market quiet. Prices for Madagascar firmer.

No. 1 flake, 10c. up; fine flake, 8c. up. Foundry facings, 4c. up. Amorphous, fine ground, 3c. up; fine ground crystalline, 5c. up. Crude amorphous graphite, $15@$35 per ton, according to grade. Buying for immediate needs only.

Greensand—Per ton, f.o.b. cars, *New Jersey:* Screened and bagged, best grade in carload lots, $25. Seasonal dullness.

Gypsum—Per ton f.o.b. mill, depending upon location: Crushed, $2.75@$3; ground, $4@$10; agricultural, $6@$15; calcined, $8@$10.

Iron Oxide (See Ocher) — Standard Spanish red, 2¾@4c. per lb.; domestic earth, 2@4½c.

Kaolin—See China Clay.

[1]**Lepidolite** — $20@$30 per ton for ordinary grades. Nominal.

Limestone — F.o.b. shipping points, depending on location, either lump or crushed, 75c.@$2 per ton.

Agricultural, 75c. up to $4 or $5 for crushed or pulverized. Prices depend upon source, purity, and fineness.

Magnesite — Per short ton, f.o.b. *California* mines: Grade "A" calcined, 80 per cent through 200 mesh, $40; grade B, $38; dead burned, $33; crude, $14. F.o.b. Eastern seaboard, calcined, $40. Market fair.

Mica—F.o.b. plant, per ton:

New Hampshire: Mine run, $320; clean shop scrap, $25; mine scrap, $20. White dry ground, 20 mesh, $28; 40 mesh, $35; 60 mesh, $55; 100 mesh, $70; 200 mesh, $85. Fair demand.

North Carolina: White, ground, 20 mesh, $35; 70 mesh, $100.

Madagascar, amber, dark, free from iron, per lb., f.o.b. *New York*, duty paid: Special, $3.50@$4. No. A1, $3@$3.50; No. 1, $3; No. 2, $2.50@$2.75; No. 3, $1.25@$1.30; No. 4, 70@80c.; No. 5, 45@55c. Strong market on account of cyclone destroying port of shipment (Tamatave) in Madagascar. No arrivals expected for several months.

[1]**Monazite**—Minimum 6 per cent ThO_2, $120 per ton.

Ocher — F.o.b. *Georgia* mines, per ton: $22.50@$25 in sacks; $25@$30 in barrels; washed and water floated, $22@$25; second grade, 99 per cent through 225 mesh, $18. Market fair.

Phosphate—Per long ton, f.a.s. or f.o.b. mines:

Florida, pebble, f.a.s., for export: 76@77 per cent, $7; 75 per cent, $6.25; 74@75 per cent, $6; 70 per cent, $4.50; 68 per cent, $4.10; 66 per cent, $4. Prices firm; Market active..

Florida, pebble, domestic: 76@77 per cent, $6; 75 per cent, $5.25; 74@75 per cent, $5; 72 per cent, $4; 70 per cent, $3.50. Market dull and prices easy, on account of small buying by fertilizer manufacturers.

Tennessee, ground, 95 per cent through 100 mesh, basis 65 per cent B.P.L. (tricalcium phosphate), $8 per short ton, with unit differential of 20c. per ton. Market slow. Brown lump for acid manufacturers, per gross ton, $5.50 on 75 per cent basis; $4.50 for 72 per cent basis.

Potash — The ruling contract prices are as follows:

	Bags	Bulk
Muriate of potash 80 @ 85 per cent, basis 80 per cent....	36.40	34.80
Sulphate of potash 90 @ 95 per cent, basis 90 per cent....	47.30	45.70
Sulphate of potash-magnesia 48 @ 53 per cent, basis 48 per cent	27.25	25.65
Manure salt 30 per cent.....	21.75	18.75
Manure salt 20 per cent.....	15.40	12.40
Kainit 14 @ 16 per cent....	12.50	9.50
Kainit 12.4 per cent.....	12.00	9.00

Two thousand pounds net weight, c.i.f. Atlantic and Gulf ports. German weights, tares and analyses. Although the guarantee against price declines of both the German and French syndicates expired April 30, producers' representatives have not announced whether there will be any immediate change in quotations.

Discounts: 5 per cent on minimum of 50 tons K_2O; 6 per cent on 100 tons; 7 per cent on 300 tons; 10 per cent on 500 tons.

Pumice Stone — In barrels, per lb., powdered, 2½@4c.; selected lump, 5@7c.

Pyrites—Tharsis, per long-ton unit of sulphur, c.i.f. U. S. ports: guaranteed 48 per cent sulphur, furnace size, 2½-in. diameter, 13@13¾c. Same price for fines screened through ½-in. mesh. Cinder from ore to remain property of buyers. Good inquiry; fair buying.

[1]**Quartz Rock Crystals** — Colorless, clear and flawed, pieces ¼ to ½ lb. in weight, 40c. per lb. in ton lots. For optical purposes, double above prices; larger crystals still higher.

Silica—Water ground and floated, per ton in bags f.o.b. Illinois: 400 mesh, $31; 350 mesh, $26; 250 mesh, $18. Market fair. Glass sand, f.o.b. producing plant, 75c.@$5 per ton; molding sand, 65c.@$3.50; blast sand, $1.35@$3.50.

[1]**Spodumene**—$20@$30 per ton, depending upon lithium content. Nominal.

Sulphur—$18 per ton for domestic market, f.o.b. Texas mines; $22 for export, Atlantic ports. Prices in reality are on a c.i.f. basis, but the average price reduced to an f.a.s. figure is about as given. Good shipment against contracts. Open prices $1 higher than above.

Talc — Per ton, carload lots, f.o.b. works, containers included:

Vermont: 99 per cent through 200 mesh, extra white, $10.50; 96 per cent through 200 mesh, medium white, $9.50; packed in 50-lb. paper bags. Demand firmer but uneven. Competition active.

New York: Double air-floated, 200 mesh, $13.75; 325 mesh, $13.75. Demand fair.

Georgia: Powdered, gray, $7.50@$10; yellow, $9@$12; red, $11@$13; roofing, $7.50@$9. Market fair.

New Jersey: Soapstone, ground, 10@$12; market good.

Tripoli—Per short ton, burlap bags, paper liners, minimum carload 30 tons, f.o.b. *Missouri:* Once ground through 40 mesh: rose and cream colored, $14. Double ground through 110 mesh: rose and cream, $17. Air-floated through 200 mesh, rose and cream, $25; mill run, $15. Business fair.

[1]**Zircon**—95 per cent, 3c. per lb., f.o.b. mines, in carload lots.

Mineral Products

Arsenious Oxide (white arsenic)—3¾c. per lb. London, £15½ per long ton for Cornish white.

[1]Price furnished by Foote Mineral Co., Philadelphia.

Calcium Molybdate—$1.20 per lb. of contained Mo, delivered.

Copper Sulphate (Blue Vitriol)—4.90c.@5c. per lb., depending on quantity, for either large or small crystals.

Sodium Nitrate—Crude, per 100 lb., ex vessel, Atlantic ports, $2.35 for spot; future delivery, $2.25.

Sodium Sulphate (Salt Cake)—Per ton, bulk, f.o.b. works, $18@$20.

Zinc Oxide—Per lb. in bags, in car lots: Lead-free, 6½c.; 10, 20 or 35 per cent leaded grades, 6⅝c.; French red seal, in bags, 9⅝c.

Ferro-Alloys

[1]**Ferrocerium**—Per lb., $5.50.

Ferrochrome—Per lb. of contained chromium, 60@70 per cent chromium, 4 to 6 per cent carbon, 11½c.

Ferromanganese—Domestic and foreign, 78@82 per cent, $90 per gross ton furnace, for delivery during second half of 1927. Spiegeleisen, 19@21 per cent, $34@$35 on carload business, f.o.b. furnace; 16@19 per cent, $32. Market weak; consumers covered for early needs.

Ferromolybdenum — Per lb. of Mo, f.o.b. shipping point, 50@60 per cent Mo, $1.25 on contract; $1.30 for spot. Business good; mostly on contract.

Ferrophosphorus — Per ton, 18 per cent P, $91; electrolytic, 24 per cent, $122.50; f.o.b. *Alabama* and *Tennessee*.

Ferrosilicon—Per gross ton, f.o.b. works, freight allowed on carload lots east of Mississippi River: 50 per cent, $85; 75 per cent, $145; 14@16 per cent, $45. Active market. Spot prices for small lots slightly higher.

Ferrotitanium—For 15 to 18 per cent material, $200 per ton, f.o.b. Niagara Falls, N. Y.

Ferrotungsten—Per lb. of W contained, 75@80 per cent W, 95@98c., f.o.b. works. Quiet.

Ferrovanadium—Per lb. of V contained, f.o.b. works, $3.15@$3.65, depending on grade. Market good.

Metal Products

Rolled Copper—Sheets, 21¼c.; wire, 14⅝@14½c. per lb., f.o.b. mill.

Lead Sheets — Full rolled, 10c. per lb.; clipped, 10¼c.

Nickel Silver—28½c. per lb. for 18 per cent nickel Grade A sheets.

Yellow (Muntz) Metal — Dimension sheets, 18½c. per lb.; rods, 15½c. per lb.

Zinc Sheets—9¾c. per lb., f.o.b. works.

Refractories

Chrome Brick—$45 per net ton, f.o.b. shipping point.

Fireclay Brick — First quality, $43 per M., *Ohio, Kentucky, Central Pennsylvania;* second quality, $35.

Magnesite Brick—9-in. straights, $65 per net ton, f.o.b. works.

Silica Brick—Per M., *Pennsylvania* and *Ohio*, $43; *Alabama*, $49; *Illinois*, $50@$52.

[1]**Zirkite**—Powdered, 80 per cent ZrO_2, 3c. per lb. Brick, straights, 80c.@$1 each.

Metal Statistics

Monthly Average Prices of Metals

Silver

	New York		London Spot		Sterling Exchange	
	1926	1927	1926	1927	1926	1927
anuary	67.795	55.795	31.322	25.863	485.295	484.775
February	66.773	57.898	30.797	26.854	485.852	484.551
March	65.880	55.306	30.299	25.655	485.606	484.887
April	64.409	56.399	29.682	26.136	485.702	485.178
May	65.075	56.280	30.125	26.072	485.485	485.288
June	65.481	56.769	30.248	26.203	486.000	485.183
July	64.793	.....	29.861	.....	485.755	.....
August	62.380	.....	28.773	.....	485.293	.....
September	60.580	.....	27.904	.....	484.845	.....
October	54.505	.....	25.291	.....	484.475	.....
November	54.141	.....	25.192	.....	484.359	.....
December	53.466	.....	24.733	.....	484.553	.....
Year	62.107	.....	28.686	.....	485.268	.....

New York quotations, cents per ounce troy, 999 fine. London, pence per ounce, sterling silver, 925 fine.

Copper

	New York		London Spot			
	Electrolytic		Standard		Electrolytic	
	1926	1927	1926	1927	1926	1927
January	13.822	12.990	59.013	55.414	65.325	62.375
February	13.999	12.682	59.669	54.438	66.375	61.119
March	13.859	13.079	58.603	55.935	65.489	62.641
April	13.706	12.808	57.200	55.056	64.600	61.526
May	13.599	12.621	56.494	54.563	64.313	60.881
June	13.656	12.370	56.778	54.030	64.591	59.881
July	13.924	.....	57.864	.....	65.625	.....
August	14 174	.....	58.857	.....	66.857	.....
September	14.062	.....	58.705	.....	66.528	.....
October	13.862	.....	58.304	.....	66.298	.....
November	13.576	.....	57.293	.....	65.551	.....
December	13.302	.....	56.869	.....	64.114	.....
Year	13.795	.....	57.971	.....	65.472	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Lead

	New York		St. Louis		London			
	1926	1927	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	9.255	7.577	9.102	7.392	34.778	34.584	27.485	27.786
February	9.154	7.420	8.991	7.286	33.903	33.903	27.344	27.781
March	8.386	7.577	8.165	7.328	31.625	31.921	27.845	28.302
April	7.971	7.126	7.764	6.807	28.775	29.284	26.546	27.053
May	7.751	6.616	7.538	6.269	28.253	28.719	25.054	25.526
June	8.033	6.414	7.876	6.150	29.986	30.142	24.438	24.750
July	8.499	.....	8.383	.....	31.716	31.545	.....	.....
August	8.908	.....	8.722	.....	32.756	32.345	.....	.....
September	8.786	.....	8.515	.....	32.085	31.790	.....	.....
October	8.402	.....	8.130	.....	30.821	30.696	.....	.....
November	8.005	.....	7.800	.....	29.270	29.563	.....	.....
December	7.855	.....	7.688	.....	28.932	29.264	.....	.....
Year	8.417	.....	8.223	.....	31.075	31.146	.....	.....

New York and St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Tin

	New York				London	
	1926	1927	1926	1927	1926	1927
	99%		Straits		Spot	
January	61.415	64.785	62.275	66.415	282.038	297.804
February	62.653	66.528	63.705	69.142	287.107	306.125
March	63.472	67.833	64.505	69.199	292.288	313.315
April	61.962	66.069	63.389	67.933	281.388	302.572
May	60.165	63.935	62.305	67.510	270.125	294.938
June	58.409	64.226	60.611	67.466	268.352	296.006
July	61.365	.....	63.091	.....	282.102	.....
August	63.875	.....	65.260	.....	293.690	.....
September	66.535	.....	68.895	.....	306.273	.....
October	68.225	.....	70.245	.....	312.548	.....
November	68.667	.....	70.630	.....	309.284	.....
December	66.635	.....	68.514	.....	306.994	.....
Year	63.615	.....	65.285	.....	291.016	.....

New York quotations, cents per pound. London, pounds sterling per long ton.

Zinc

	St. Louis		London			
	1926	1927	1926 Spot	1926 3 Mos.	1927 Spot	1927 3 Mos.
January	8.304	6.661	38.059	37.363	30.979	30.938
February	7.759	6.673	36.053	35.956	29.931	30.109
March	7.332	6.692	34.090	34.247	30.649	30.889
April	7.001	6.338	32.503	32.863	29.579	29 901
May	6.821	6.075	32.038	32.413	29 034	29 131
June	7.112	6.213	33.244	33.398	28.598	28.613
July	7.411	.....	34.045	34.270	.....	.....
August	7.376	.....	34.173	34.524	.....	.....
September	7 413	.....	34.389	34.415	.....	.....
October	7 296	.....	34.256	34.146	.....	.....
November	7 199	.....	33.491	33.483	.....	.....
December	7.018	.....	32.915	32.895	.....	.....
Year	7.337	.....	34.105	34.164	.....	.....

St. Louis quotations, cents per pound. London, pounds sterling per long ton.

Antimony, Quicksilver and Platinum

	Antimony (a)		Quicksilver (b)		Platinum (c)			
	New York		New York		Refined		Crude	
					New York			
	1926	1927	1926	1927	1926	1927	1926	1927
Jan	23.490	13.910	87.960	101.200	118.200	109.520	113.200	99.820
Feb	21.676	14.509	87.580	101.727	113.909	107.545	108.341	99.295
March	19.708	12.801	88.194	110.259	112.000	108.000	106.278	100.426
April	17.462	14.166	89.769	123.250	111.538	101.885	103.731	91.865
May	12.170	12.975	91.365	123.900	108.960	84.680	102.900	75.000
June	11.106	12.447	91.346	118.096	111.000	72.000	106.615	62.500
July	14.490	.....	90.163	.....	114.692	.....	109.000	.....
Aug	15.957	.....	89.260	.....	116.000	.....	108.692	.....
Sept	15.325	.....	91.425	.....	116.840	.....	108.600	.....
Oct	13.943	.....	97.260	.....	112.240	.....	106.000	.....
Nov	13.385	.....	99.000	.....	112.000	.....	105.250	.....
Dec	13.142	.....	99.510	.....	111.846	.....	105.385	.....
Year	15.988	.....	91.903	.....	113.269	.....	106.999	.....

(a) Antimony quotations in cents per pound, for ordinary brands. (b) Quicksilver in dollars per flask of 76 lb. Prior to June, 1927, the unit had been the 75 lb. flask. (c) Platinum in dollars per ounce.

Pig Iron, Pittsburgh

	Bessemer		Basic		No. 2 Foundry	
	1926	1927	1926	1927	1926	1927
January	22.76	21.04	21.76	20.01	22.26	20.26
February	22.76	20.76	21.76	19.76	22.26	20.26
March	22.76	21.15	21.76	20.33	22.26	20.26
April	21.38	21.26	20.66	20.49	21.05	20.26
May	21.12	20.94	19.76	19.96	20.76	20.26
June	20.76	20.66	19.76	19.62	19.80	20.11
July	20.44	.....	19.26	.....	19.49	.....
August	19.87	.....	19.18	.....	19.26	.....
September	20.11	.....	19.26	.....	19.30	.....
October	20.76	.....	19.76	.....	19.97	.....
November	21.90	.....	20.46	.....	20.96	.....
December	21.26	.....	20.26	.....	20.53	.....
Year	21.31	.....	20.29	.....	20.64	.....

In dollars per long ton.

Monthly Crude Copper Output in Short Tons

Domestic

	1926	1927				
	Dec.	Jan.	Feb.	March	April	May
Alaska shipments	2,372	2,981	2,696	3,163	2,121	3,045
Braden	9,235	8,756	8,022	7,293	7,164	.....
Chile	9,352	9,352	9,352	9,352	9,352	.....
Butte & Superior	†613	.....	.....	†416	.....	.....
Calumet & Arizona	1,951	1,864	1,500	2,704	1,711	2,422
Magma	1,148	1.264	1,120	1,308	1,232	1,270
Miami	2,268	2,313	2,160	2,342	2,295	2,346
New Cornelia	3,347	2,770	2,373	3,447	2,630	2,776
Nevada Con	†31,316	.....	.....	†28,970	.....	.....
Old Dominion	1,120	1,170	1,162	986	879	1,030
Phelps Dodge	5,732	6,097	6,427	††7.789	8,063	7,972
United Verde Extension	1,586	1,703	1,152	1,322	1,630	2,051
Utah Copper	†32,557	.....	.....	†30,876	.....	.....
Tennessee Copper	486	486	408	458	410	433

Foreign

Boleo, Mexico	.....	863	885	973	550	1,017
Furukawa, Japan	1,502	1,456	1,249	1,638	.....	.....
Granby Cons., Canada	*2,355	2,439	1,975	2,339	2,123	2 989
Union Miniere, Africa	7,150	6,505	6,273	6,976	6,039	7,050
Mount Lyell, Aust	†1,870	.....	.....	† 1,347	.....	.....
Sumitomo, Japan	.....	1,408	1,347	1,436	.....	.....
Bwana M'Kubwa	376	400	358	450	360	515

*Starting with December Allenby production is included. †Three months.
††Starting with March Moctezuma is included.

Monthly Production of Primary Copper from U. S. Mines and Daily Rate (Short Tons)

	1925		1926		1927	
	Monthly Production	Daily Rate	Monthly Production	Daily Rate	Monthly Production	Daily Rate
January	74,789	2,412	71,026	2,291	76,198	2,458
February	68,967	2,463	68,131	2,433	69,202	2,472
March	74,901	2,416	75,728	2,443	69,314	2,236
April	70,667	2,356	73,454	2,448	71,122	2,371
May	70,574	2,276	73,542	2,372	71,749	2,315
June	59,894	2,330	71,317	2,377	.....	.....
July	68,507	2,210	72,278	,330	.....	.....
August	68,090	2,196	72,014	2,323	.....	.....
September	67,720	2,272	72,672	2,421	.....	.....
October	71,042	2,292	75,099	2,423	.....	.....
November	67,400	2,247	74,947	2,498	.....	.....
December	69,566	2,244	72,205	2,329	.....	.....
Total	842,117	.....	872,509	.....	357,585	.....
Monthly average	70,176	.....	72,709	.....	71,517	.....
Average of daily rate	.....	2,307	.....	2,390	.....	2,368

Mining Stocks—Week Ended July 2, 1927

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Anaconda	New York	43	41½	43	Jy.16, Au.22 Q	0.75
Arcadian Consol.	Boston	*30	*30	*30		
Ariz. Com'l	Boston	5⅛	5⅛	5⅛	Ja. 7, Ja. 28	0.50
Calaveras	N. Y. Curb			1⅝		
Calumet & Arizona	New York	63	61½	62	Ju. 13, Ju. 20 Q	1.50
Calumet & Hecla	Boston	147/8	14⅛	14⅜	My.31, Jn.15 Q	0.50
Cerro de Pasco	New York	59	58	58⅞	Ap. 14, My. 2 Q	1.00
Chile Copper	New York	33⅝	33⅛	33⅛	Jn.3, Jn.30, Q	0.62½
Con. Coppermines	N. Y. Curb	2⅛	2⅛	2⅛		
Copper Range	Boston	12⅛	12⅛	12⅛	Ap.2, My.2, A	1.00
Crystal Copper	BostonCurb	*49	*40	*44		
East Butte	Boston	1⅛	1⅛	1⅛	Dec., 1919	0.50
Granby Consol	New York	35⅛	33⅝	35⅛	Jn.15 Jy. 1 Q	1.00
Greene-Cananea	New York	41	39⅜	40⅛	Nov., 1920	0.50
Howe Sound	New York	37¼	35	35	Apr.1, Apr.15 Q	1.00
Inspiration Consol	New York	13¾	12⅛	13⅛	Ma.17, Ap.4, Q	0.25
Iron Cap	Boston Curb			2⅛		
Isle Royale	Boston	9⅛	9⅛	9⅛	Fe.4, Fe.19, Q	0.50
Kennecott	New York	61⅜	60¼	61	Ju. 3, Jy. 1 Q	1.25
Magma Copper	New York	34⅛	32⅜	32⅜	Jn.30, Jy.15, Q	0.75
Mason Valley	N. Y. Curb	1	1	1		
Miami Copper	New York	14¼	13⅛	14	My.2, My.16 Q	0.37½
Mohawk	Boston	39	37⅛	37⅛	Ap.30, Jn.1 Q	1.00
Mother Lode Coal	New York	2⅛	2⅛	2⅛	Jn.10, Jn.30	0.25
Nevada Consol	New York	13⅛	12⅛	13	Jn. 3, Jn. 7 Q	0.37½
New Cornelia	Boston	19⅛	18⅛	19⅛	My.6, My.23 Q	0.50
Noranda	N. Y. Curb	22¼	20	20⅛		
North Butte	Boston	*90	*75	*90	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	*80	*72	*78	Sept. 1926	0.03
Old Dominion	Boston	11⅛	10⅜	10⅜	Dec., 1918	1.00
Phelps Dodge	N. Y. Curb			114	Jn.18, Jy.1 Q	1.50
Quincy	Boston	15	13⅛	14	March, 1920	1.00
Ray Consolidated	New York	14	13⅛	14	Ap.20, Ap. 30	0.25
St. Mary's Min. Ld.	Boston	20	18½	18⅛	Fe.10, Ma.10	2.00
Seneca Copper	New York	2⅛	1	1⅛		
Shattuck-Denn	Boston Curb	4½	4⅜	4⅜		
Tenn. C. & C	New York	8½	8½	8½	My.31, Ju.15, Q	0.12½
United Verde Ex	N. Y. Curb	23¼	22⅜	23⅛	Jy.6, Au.1 Q	0.75
Utah Copper	New York	115	115	115	Jn. 17, Jn. 30 Q	1.50
Utah Metal & T	Boston	1	*85	*85	Dec., 1917	0.30
Walker Mining	Salt Lake	*55	*55	*55		
NICKEL-COPPER						
Internat. Nickel	New York	61⅛	57⅛	61	Jn. 16, Jn. 30 Q	0.50
Internat. Nickel pfd.	New York			109	Ap. 14, My. 2 Q	1.50
LEAD						
Gladstone Mtn	Spokane	*22⅛	*20⅜	*20⅜	April, 1927	0.005
National Lead	New York	99⅛	96⅛	96⅝	Jn. 10, Jn.30 Q	1.25
National Lead pfd	New York	132	132	132	My.10, Jn.15 Q	1.75
St. Joseph Lead	New York	38⅛	37⅜	37⅞	Se.10, Se.20, QX	0.75
ZINC						
Am. Z. L. & S	New York	7	6⅞	7	May, 1917	1.00
Am. Z. L. & S. pfd.	New York	42	39	40⅞	Nov., 1920	1.50
Butte C. & Z	New York	4⅛	4⅛	4⅛	De. 9, De. 24	0.50
Butte & Superior	New York	8⅞	8⅛	8⅛	Jn. 17, Jn. 30 Q	0.50
Callahan Zn-Ld	New York	2	1⅝	2	Dec., 1920	0.50
Consol. Lead&Zinc'A'	St. Louis	12⅜	12⅛	12⅜	Ma.15, Ap.1 Q	0.25
Eagle-Picher	Cincinnati	26⅜	26⅛	26⅜	Au.15, Se.1 Q	0.40
Eagle-Picher pfd.	Cincinnati			116	Jn.30, Jy.15 Q	1.50
New Jersey Zn	N. Y. Curb	180	180	180	Jn.20, Jy.9 QX	2.00
United Zinc	N. Y. Curb			*55		
Yellow Pine	Los Angeles	*26	*26	*26	Dec. 1925 Q	0.04
GOLD						
Alaska Juneau	New York	1	1	1		
Argonaut	Toronto	*29	*25⅛	*27⅛		
Barry-Hollinger	Toronto	*33	*30⅛	*30⅛		
Consol W. Dome L.	Toronto	*7	*6	*6⅝		
Cresson Consol. G.	N. Y. Curb	2 3/16	2 3/16	2 3/16	Ma.31, Ap.10 Q	0.10
Dome Mines	New York	7⅛	7	7	Jn. 30, Jy. 20 Q	0.25
Golden Cycle	Colo.Springs	†1.66	†1.65		My.31, Jn.10 Q	0.04
Hollinger Consol	Toronto	18.90	18.25	18.30	Jn. 29, Jy. 15 Q	0.10
Homestake Mining	New York	61	61	61	Jn. 24, Jn. 25 M	0.50
Kirkland Lake	Toronto	1.40	1.30	1.37		
Lake Shore	Toronto	19.30	18.35	18.95	Jn.1, Jn.1 X	0.20
McIntyre-Porcupine	New York	25⅜	25	25	My.2, Jn.1 Q	0.25
Portland	Colo.Springs	†*38	†*30		Ap.6, Ap.15, Q	0.02
Rand Mines	New York			9½	Au.23-30 Am.Sh.	1.52
Teck-Hughes	Toronto	7.79	7.25	7.75	Ja.31, Fe.1	0.05
Tom Reed	Los Angeles	*55	*45	*45	Dec., 1926	0.02
Tough-Oakes	Toronto	*40	*37	*39½		
United Eastern	N. Y. Curb	*42	*35	*42	July, 1924	0.05
Vipond Cons	Toronto	*90	*81½	*82½	Apr.1, Apr.15	0.03
Wright-Hargreaves	Toronto	5.70	5.50	5.55	Ap.15, My.2	0.10
GOLD AND SILVER						
Carnegie Metals	Pittsburgh	12½	12½	12½		
Con. Cortez	N. Y. Curb	*20	*20	*20		
Con. Virginia	San Francisco	*3¼	*2½	*2½		
Dolores Esperanza	N. Y. Curb	*50	*50	*50	July, 1923	0.05
Premier Gold	N. Y. Curb	2	2	2	Jn. 14, Jy. 5	0.08
Tonopah Belmont	N. Y. Curb	1⅞	1⅞	1⅞	Ma.15, Ap.4	0.08
Tonopah Extension	N. Y. Curb	*28	*26	*28	Apr. 1925	0.05
Tonopah Mining	N. Y. Curb			2⅜	Ma.31, Apr.21	0.07½
West End Consol	N. Y. Curb	*7	*7	*7	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*45	June, 1918	0.02
SILVER						
Beaver Consol	Toronto	1.07	1.04	1.04	May, 1920	0.03
Canadian Lorrain	Toronto	*15	*11⅛	*15		
Castle-Trethewey	Toronto	*85	*82	*82½		
Coniagas	Toronto	3.75	3.50	3.70	May, 1924	0.12½
Keeley	Toronto	1.28	1.05	1.08	Fe.28, Ma.15 X	0.12
Lorrain Trout Lake	Toronto	*77	*75	*75	July, 1925	0.05
McKinley-Dar.-Sav.	Toronto	*15⅛	*15	*15⅛	Oct., 1920	0.03
Mining Corp. Can	Toronto	3.25	3.05	3.07	Jn. 29, Jy. 15	0.12½
Nipissing	N. Y. Curb	5¾	5⅛	5⅝	Jn 30, Jy.20	0.07½

Stock	Exch.	High	Low	Last		Last Div.
SILVER-LEAD						
Ahumada	New York	3⅛	3	3	Ma. 25, Ap.4, QX	0.12½
Bingham Mines	Boston	43⅛	43	43	Jn.27, Jy. 5 Q	1.00
BunkerHill&Sullivan	N. Y. Curb	95¾	90½	90½	My.31, Jn.4 X	0.75
Cardiff M. & M	Salt Lake			*45⅝	Feb. 5, 1927	0.10
Chief Consol	Salt Lake	3.20	2.90	3.10⅛	Nov., 1926 Q	0.10
Consti'nMng.&Mill'g	Spokane	*30	*28	*30		
Erupcion	Boston Curb	*40	*40	*40	Jn. 25, Jy. 5 Q	0.07½
Eureka Lily	Salt Lake	1.50	1.47½	1.47½		
Federal M. & S	New York			148	Jn.25, Jn.29 Spec.	$10
Federal M. & S pfd.	New York	93⅛	91⅛	92	My.25, Ju.15 Q	1.75
Hecla Mining	N. Y. Curb	15	14⅝	15	My.4, Ju. 15 Q	0.25
Highland-Surprise	Spokane	*12⅛	*10⅛	*11		
Iron King Mining	Salt Lake	*60	*50	*58		
Keystone Mining	Salt Lake			*25	Au. 12, Au. 26	0.07½
Lucky Jim	Spokane	*18⅛	*18	*18⅛		
Lucky Tiger-Com	Kansas City	†7.15	†6.75		Jn.10, Jn.20	0.05
Mammoth Mining	Salt Lake	1.57½	1.55	1.57½	Jn.10, Jn.20 Q	0.05
Marsh Mines	Spokane	1⅛	*75	1⅛		
North Lily	Salt Lake	3.60	3.45	3.60		
Park Utah	New York	6⅜	6⅛	6⅛	Jn. 25, Jy. 1 Q	0.20
Plutus Mining	alt Lake	1.90	1.87	1.90	Ja. 10, Ja. 15 Q	0.10
San Rafael	San Francisco			*24		
Silver King Coal	Salt Lake	7.80	7.80	7.80	Jn. 20, Jy. 1 Q	0.25
Silversmith	Spokane	*36⅛	*34⅛	*35	Oct., 1926 Q	0.02
Stratton Mines	Spokane			*52		
Sunshine M. Co.	Spokane	*91	*88	*88		
Tamarack-Custer	Spokane	*28	*27	*27	Sept., 1924	0.25
Tintic Standard	Salt Lake	12	11⅞	12	Jn.15, Jn.28	0.40
Utah-Apex	Boston	4⅝	4⅜	4⅜	Oct., 1926	0.25
IRON						
Bethlehem Steel	New York	49	46	47⅜	July, 1924	1.25
Cleveland-Clifs Iron	Cleveland	85	83½	84	Ja. 15, Ja. 25 Q	1.00
Colorado Fuel & Iron	New York	92½	87½	90⅜	May, 1921	0.75
Gt. North'n Iron Ore	New York	18⅜	18⅛	18⅛	Dec. 6, Dec. 28	0.75
Inland Steel	New York	50	47	48⅛	My. 13, Jn. 1 Q	0.62½
Replogle Steel	New York			12⅛		
Republic I. & S	New York	63¼	61⅝	61⅞	My. 14, Jn. 1 Q	1.00
Republic I. & S. pfd.	New York	103½	103	103	Jn. 14, Jy. 1 Q	1.75
Sloss-Sheffield S. & I.	New York	117	113	117	Jn. 10, Ju. 20 Q	1.50
Sloss-Shef. S.&I. pfd.	New York			107½	Jn. 20, Jy. 1 Q	1.75
U. S. Steel	New York	121	118¼	120	Jn. 7, Jn. 29 Q	1.75
U. S. Steel, pfd.	New York	49½	49¼	49½	My.2, My.28 Q	1.75
Virginia I. C. & C	New York	44	44	44	Jan., 1924	1.50
Virginia I.C.&C. pfd.	New York			60½	Ju. 15, Jy. 1	2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN						
De Beers Consol	New York			30⅜	Ja. 26, Ja. 29	1.45
So. Am. G. & P. New	N. Y. Curb	22⅛	22⅛	22⅛		
Alum. Co. of Amer	N. Y. Curb	78	77⅛	77⅛		
Alum. Co. of Amer.pf	N. Y. Curb	103	103	103	Jn. 15, Jy. 1 Q	1.50
Vanadium Corp	New York	45⅜	44⅛	44⅛	My. 2, My. 16Q	0.75
Patino M. & E	New York	22⅝	21¾	22⅛	Ap. 27, My. 5	1 sh.
ASBESTOS						
Asbestos Corp	Montreal	23⅞	21	23	Jan., 1926	1.50
Asbestos Corp. pfd.	Montreal	88⅜	87	88⅛	Jn.30, Jy.15 Q	1.75
SULPHUR						
Freeport, Texas	New York	68⅜	64⅛	67¼	Jy. 15, Au.1 QX	1.25
Texas Gulf	New York	65⅞	61⅛	64⅝	Ju. 1, Ju. 15 Q	1.00
MINING, SMELTING, REFINING AND GENERAL						
Amer. Metal	New York	39	38⅜	38⅛	Au.20, Se.1 Q	0.75
Amer. Metal, pfd.	New York	108	108	108	Au.22, Se.1 Q	1.75
Amer. Sm. & Ref.	New York	156¼	150¼	153¼	Jn.8, Au. 1 Q	2.00
Amer. Sm. & Ref. pfd.	New York	125	124	125	Au. 1, Se. 1 Q	1.75
Consol. M. & S	Montreal	233½	215½	216	Jn. 30, Jy. 15 X	6.25
Newmont Mining	N. Y. Curb	78¾	77¾	78	Jn.30, Jy.15 Q	1.00
U. S. Sm. R. & M	New York	35½	35	35⅛	Jy. 6, Jy. 15 Q	0.87½
U.S. Sm. R.&M. pfd.	New York	49½	49¼	4?½	Jy. 6, Jy. 15 Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

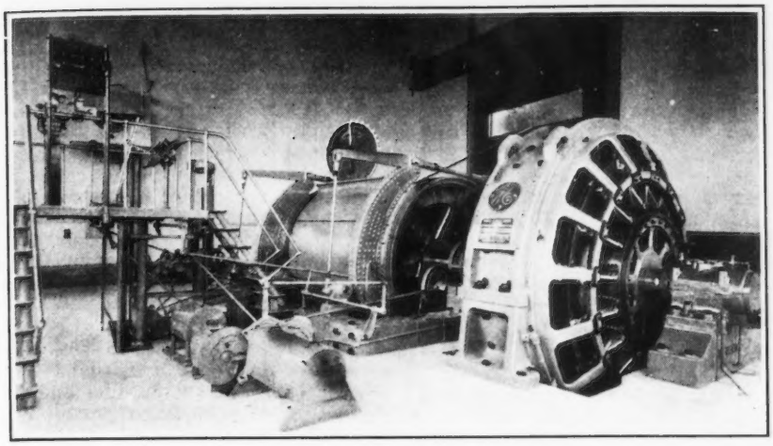
LONDON QUOTATIONS—WEEK ENDED JUNE 21, 1927

Name	High	Low	Last	Date	Last Div. Amount
Aramayo Mines (25 frs.)	87/1¼	84/4½	86/3	May, 1927	5 p.c. (†)
British Platinum (£1)	3/3	2/3	3/—	Feb., 1925	2½ p.c.
Burma Corpn. (10 rupees)	14/6	13/10½	14/3	Aug., 1927	6 annas*
Bwana M'Kubwa (5s)	5/9	5/1½	5/7½		
Camp Bird (2s)	4/3	4/—	4/3		
El Oro (£1)	4/3	4/—	4/3	Nov., 1924	2½ p.c.*
Esperanza (10s)	—/0½	—/0½	—/0½		
Frontino & Bolivia (£1)	14/3	12/6	13/9	July, 1927	5 p.c.
Mexican Corpn. (£1)	11/—	10/6	10/9		
Mexico Mines of El Oro (£1)	17/6	16/3	17/6	Dec., 1926	3¾ p.c.*
N'Changa Copper Mining	14/4½	13/9	14/4½		
Oroville Dredging (£1)	6/—	5/3	5/6	Dec., 1923	3¾ p.c.
Ouro Preto (£1)	2/1½	2/—	2/—	May, 1925	2½ p.c.
Rhodesian Congo Border (£1)	56/6	53/9	55/—		
St. John del Rey (£1)	11/9	11/4½	11/6	May, 1927	3¾ p.c.
San Francisco Mines (10s)	30/7½	29/7½	29/9	July, 1927	15s.
Santa Gertrudis (£1)	18/—	17/6	17/9	July, 1927	7½ p.c.
Selukwe (2s. 6d.)	8/9	8/3	8/6	April, 1917	6¼ p.c.
S. Amer. Copper (2s.)	3/1½	3/—	3/—	Nov., 1917	75 p.c.
Tanganyika (£1)	50/—	47/10½	48/9	Aug., 1926	7½ p.c.
Union Miniere du Haut-Katanga (Brussels)	9.175	9.010	9.165	July, 1926	175 (‡)

* Free of British income tax. † Swiss frs. ‡ Belgian frs. and free of taxation.

New Machinery and Inventions

Anaconda Puts Large Hoist in Service



Chippy hoist has a three-deck cage

ONE of the largest hoists ever made is now hoisting ore at the Belmont mine of the Anaconda Copper Mining Co., at Butte, Mont. This equipment, with its chippy hoist, is the first of the new electric hoists purchased last year to be put in operation by that company.

Ore was first raised by the new hoist on May 3. The chippy hoist had been operating for two or three weeks previous to that date. The remaining hoists are expected to be in operation in a short time at the Badger State and Mountain Consolidated mines.

When the new hoists were purchased last year, it was planned to extend not only these three mines but possibly several others to a depth of about 5,000 ft. Ore was being mined at that time at a depth of 3,200 ft. Should any of these mines ever reach a depth of 5,200 ft., the bottom of the mine will be at sea level, and thus it would be possible, considering the speed at which the hoists operate, to go from Butte to sea level in 152 sec.

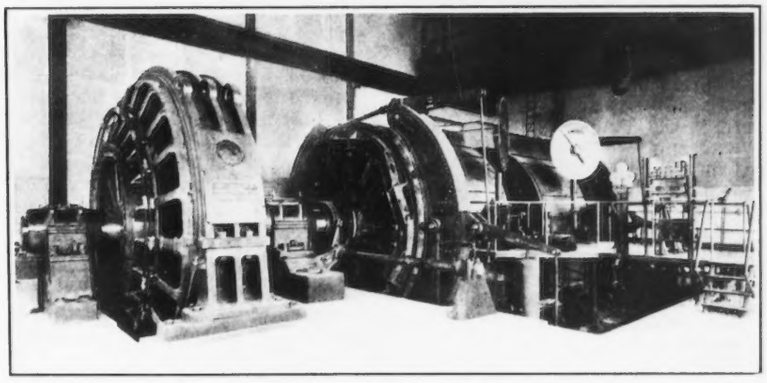
Equipment for the new Belmont mine hoist was supplied by the Nordberg Manufacturing Co. and the General Electric Co. and includes the following apparatus: One 2,150-hp. direct-current main hoist motor, rated 59½ r.p.m., 750 volts, shunt-wound; one synchronous motor-generator set rated 1,650 kw., 514 r.p.m., 750 volts, and including a 2,300-kva., 2,400-volt, 60-cycle, three-phase, synchronous motor and a 63-kw. direct-current exciter.

The chippy hoist is driven by a 1,050-hp., 59½-r.p.m., 500-volt, shunt-wound motor, and power is furnished from a direct-current motor-generator set consisting of a 1,200-kva., 900-r.p.m., 2,400-volt, 60-cycle, three-phase synchronous motor and a 800-kw., 900-r.p.m., 500-volt, compound-wound generator, and including a direct-connected exciter rated 33 kw., 900 r.p.m., 250/250 volts.

Both hoists are designed to operate to a maximum depth of 5,200 ft. Specifications of the main hoist are as follows: Weight of skip on main hoist, 10,500 lb. Weight of skip cage, 4,000 lb. Weight of ore per trip, 14,000 lb. Rope diameter, 1⅝ in. Total weight of rope for 5,200 ft., 28,900 lb. Maximum rope speed, 2,250 f.p.m. Maximum speed of drums, 59½ r.p.m. Tons per hour, according to duty cycle, 146.3 from 5,200 level.

The specifications on the chippy hoist are as follows: Weight of three-deck cage, 7,400 lb. Weight of three ore cars (one on each cage), 2,700 lb. Weight of ore per trip, 5,400 lb. Rope diameter, 1⅜ in. Weight of rope (5,200 ft.) 15,300 lb. Maximum rope speed, 1,500 f.p.m. Maximum speed of drums, 59½ r.p.m.

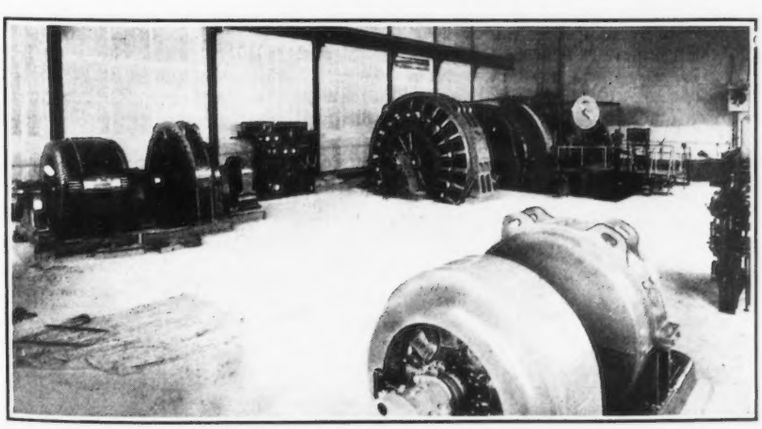
The chippy hoist always operates out of balance, whereas the main hoist is supposed always to operate in balance, although the motor has sufficient capacity to operate under full-load conditions unbalanced should it become necessary to do so.



Main hoist built to operate to 5,200-ft. level

Anaconda's new main hoist is the largest hoist in the Butte camp, and the chippy hoist is much larger than any other one of its type now installed in the camp. The duplicate main and chippy hoist equipment at the Badger State mine is expected to go into operation soon.

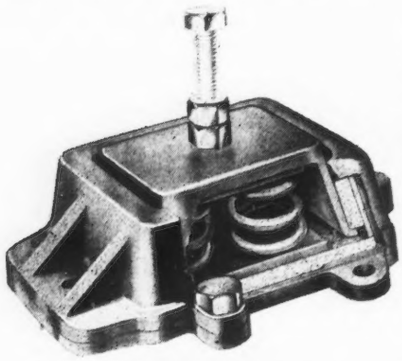
The main hoist at each mine consists of a double-clutched drum, 12 ft. in diameter, and driven by the direct-current motor mentioned. This motor is direct-connected to the drums through a solid coupling. Operation in balance from various levels is made possible by the use of drums made loose on the driving shaft and capable of being clutched to it in any desired position. Ward-Leonard control is used. The hoists are manually controlled through a master switch controlling the voltage from the generator. An unusual number of safety features is also provided. The same method of control is used on the auxiliary hoists. A single 8-ft. drum is employed in the operation of the chippy hoist.



Ward-Leonard control provides accurate speed regulation with great safety

Use of Dampers Wipes Out Virtually All Vibration

As a result of several years' research, design and experience obtained through actual operation, the Korfund Co., Inc., 235 East 42nd St., New York City, has recently announced the "Vibro-Damper" for deadening noise and absorbing vibration of industrial equipment. The device is a simple, sturdy, inexpensive unit that is easily attached to the foot



A device to deaden vibrations and noise

The effects of machine vibration constitute a serious industrial problem which, it is claimed, are practically eliminated by the damper here shown. Simple construction, low first cost, long life and ease of attachment are among the advantages of this device.

or base of machines already installed. It requires no special foundation. It is said that easily adjustable spring tension permits the damper to meet varying requirements resulting from changes in speed, variation in machine loads, etc. The flexibility of the device has, it is claimed, made it particularly successful for deadening high frequency vibrations. Its quick reaction recommends the damper for many machines which operate with sudden vertical impacts. The apparatus has a wide range of application and use, among the conditions which make it particularly desirable being the following: For machines which work with heavy and sudden impacts such as punch presses, elevator machinery, paper cutters, linotypes, mixing machines, etc.; for machines of high rotative speeds such as motors, fans, blowers, centrifugal pumps and compressors, rotary converters, extractors, machine tools; for machines producing objectionable humming noises such as transformers, band and circular saws, woodworking machines; and for the smaller sizes of reciprocating machines such as steam and oil engines, ammonia compressors, pumps, printing presses, and the like.

Built in five different sizes to sustain loads of from 30 to 4,000 lb., this damper is said to be unusually compact in construction. The additional height given to the machine is so slight that it will not interfere with operation nor affect stability. In special cases, the device may be placed in a depression of the floor, thereby reducing the increase in height to a minimum. The outer housing of the damper, a strong casting, rests on a base plate, to which it is securely bolted. The inner walls are completely covered with an isolating material which is adjustable in the larger sizes of the device. Thus, the spring casing supporting the machine is resiliently separated from the housing and foundation under the damper. This casing incloses one or more springs, the tension of which can be adjusted in the simplest manner by means of the same bolt which holds the machine base to the spring casing. It is said that the height of the device is not affected by the spring adjustment. The conical design of the spring casing and motor housing effectively prevents any misalignment of the machine. Any such tendency is immediately counteracted by the greatly increasing pressures set up by the conical surfaces. In most installations, the base plate can be mounted directly upon the dampers, which are so spaced as to prevent undue bending stresses.

Chilean Ore Bridge Employs Direct-Current Control

Application of Ward-Leonard control to the hoist and trolley motions of an unusual ore bridge will be made by the Chile Exploration Co. at its plant in Chuquicamata, Chile. This ore bridge will be used to remove the crushed waste rock, known as "ripio," from the leaching vats after the copper has been extracted from the crushed ore by the leaching process. The ore bridge will be supplied by the Wellman-Seaver-Morgan Co. and is to be equipped with General Electric motors and control. The 8-ton bucket line will be geared for approximately 225 ft. per minute and will be hoisted by two 175-hp., 230-volt, shunt-wound, direct-current motors, one of which will be geared to the holding line and the other, to the closing line. A trolley, of the rope-operated type, will be driven by a single motor, a duplicate of those used on the hoist. The trolley will be geared to give an approximate free-running speed of 800 ft. per minute.

Power for the three motors will be obtained from three generators forming a part of a five-unit motor-generator set. The fourth unit of this set will be a 25-kw. exciter to supply necessary field excitation and control current. The fifth unit will be a 435-kva., 1,000-r.p.m., three-phase, 50-cycle synchronous motor. Synchronous motor drive for this set will be used to improve power factor, as a number of induction motors are used in the same plant with the motor generator. The set, which is 22 ft. long and weighs 15 tons, is mounted on a rigid, self-supporting, welded structural-steel base. Three spherical protuberances on the bottom of the base provide three-point support, so that no amount of twisting of the crane structure can affect the bearing alignment. The set is not fastened to the crane structure in any way, though chocks are provided to prevent creepage or sliding in case of a sudden stop of the crane.

All three generators in the set have differentially wound series fields, which function to reduce voltage on overloads, thus giving a drooping load curve similar to the load curve obtained on electric shovel generators.

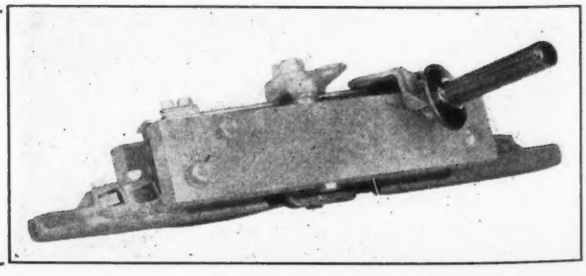
Control will be simple and will incorporate special features on the hoist motion to insure proper division of load between the holding-line and the closing-line motors and to provide correct motor speeds under empty- and loaded-bucket conditions for lowering, thus avoiding inadvertent closing of an empty bucket or opening of a loaded one.

Each of the hoist and trolley motors will be provided with a shunt-wound, solenoid brake receiving its excitation from the 25-kw. exciter. Separately mounted indicating ammeters, one for each generator, will be provided for mounting at a convenient point near the operator, in order that he may at any time obtain indication of current taken by any one of the three motors.

One of the special features of the control will be the tying of each motor and its generator together by a solid ribbon of copper interrupted only by the shunt for the indicating ammeter. No circuit-breaker contactor will be provided in the main panel and no overload relays will be included, because of the inherent drooping characteristic of the generators, which will automatically limit the amount of current that can flow.

The Hyman-Michaels Co., Chicago, has appointed the Hofius Steel & Equipment Co., Seattle Washington, as its representative in Washington and the northwestern territory.

Double-Gap Section Insulator

A new section insulator announced by the Westinghouse Electric & Manufacturing Co. is of double-beam construction, to secure mechanical strength and rigidity. In it, the switch is mounted on top so that the jaws may be adjusted or replaced without difficulty. The blade may be locked in the open position and complies with the mining laws. The underrun is metallic, with two air gaps as insulating members, and is alive when the switch is closed. Consequently, there is no loss of power. No section of the underrun is thrown out of or across the line when the switch is opened to cause the trolley wheel to jump. The wire is held in the same manner as in the type SL splicer.

Section insulator switch